AMERICAN
DYESTUFF
REPORTER

GEIGY COMPANY, Inc.

89-91 Barclay Street
New York City

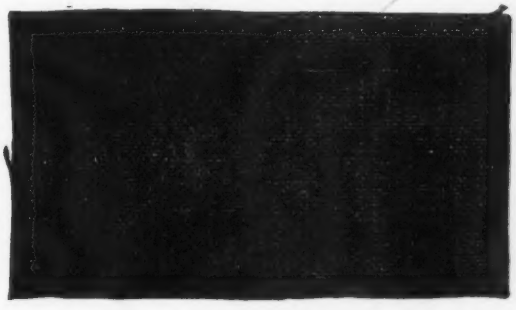
ANILINE COLORS

ERIO CHROME BLUEBLACK B

Is at its best when dyed by the usual top-chrome method. This color is suitable for all types of wool dyeing, possessing unexcelled fastness to

Light **Fulling**
Potting **Perspiration**

Erio Chrome Blueblack B when dyed on a light Indigo Bottom, produces a full bloomy shade of Blue which is fast to all requirements.



CLOTH RED B CONC.

Cloth Red B Conc., as a self shade, is the strongest full Red. Dyed by the usual acid method it possesses good all around fastness.

Using Cloth Red B Conc. in combination with Chrome Colors, it is found to produce most satisfactory results.

Sole Selling Agents for J. R. GEIGY S. A., Basle, Switzerland
Established 1764

Main Office J. R. Geigy S. A., Basle, Switzerland; in Great Britain
The Geigy Colour Co., Ltd., 35-37 Dickinson St., Manchester

BOSTON PROVIDENCE PHILADELPHIA TORONTO COLUMBUS, GA.

Headquarters of Raw Materials

for the

Textile Industry

DYESTUFFS AND COLORS OF ALL KINDS

Bichromate of Soda	Bichromate of Potash
Carbonate of Soda	Caustic Potash
Chloride of Lime	Caustic Soda
Formic Acid	French Talc
Acetic Acid	Glycerine
Gum Karaya	Verdigris

Olive Oil, Commercial

Imported Zinc Oxide

INQUIRIES SOLICITED

A·KLIPSTEIN & CO.

644-52 Greenwich St.

NEW YORK CITY

BRANCHES:

BOSTON PHILADELPHIA CHICAGO

PROVIDENCE, R. I. CHARLOTTE, N. C.

Represented in Canada by

A. KLIPSTEIN & CO., LTD., 12 ST. PETER ST., MONTREAL

American Dyestuff Reporter, Vol. XII, No. 6. March 12, 1923. Published biweekly by Howes Publishing Co., Woolworth Building, New York, N. Y. Domestic subscription, $5.00; Canadian, $5.50; foreign, $6.00. Entered as second-class matter Nov. 6, 1919, at the New York, N. Y., Post-office, under the Act of March 3, 1879. Copyrighted, 1922, by Howes Publishing Co.

MATHIESON Chemicals

LEADERSHIP

THE MATHIESON COMPANY has become a dominant factor in the Chemical Industry, due to the initiative of its Engineers, and the alertness and efficiency of its Sales Department. The quick response to the needs and convenience of our customers in the Textile Industry is reflected in the offering of Liquid Chlorine in exact net weights in the customary steel cylinders. All Mathieson Liquid Chlorine containers now hold uniform weights of 105, 150 and 2000 lbs.

This innovation is in line with other distinctive features of the service that has made us unquestionably the leaders in this field—the Mathieson Multiple-Unit Tank Car, the Mathieson Chlorine Valve, and the Mathieson plan of cleaning, drying and inspecting all cylinder equipment before re-filling.

The Mathieson Sales Organization, in co-operation with its Engineers, has devised a plan and worked out formulas for making up bleach liquors from Liquid Chlorine which will be of interest to all Executives in the Textile Industry.

This has been put into booklet form, and in it there are also described other "Eagle Thistle" Products—Caustic Soda, Soda Ash, Bicarbonate of Soda, Sesquicarbonate of Soda and Bleaching Powder. It will gladly be sent upon request.

Quality and Service have placed Mathieson FIRST.

The MATHIESON ALKALI WORKS Inc.
25 WEST 43rd STREET NEW YORK CITY

PHILADELPHIA
PROVIDENCE

CHICAGO
CHARLOTTE

Deal Direct with the Manufacturer

AMERICA'S LEADING BLACKS

AMIDINE FAST BLACK FF EXTRA
(Pre-war prototype: Columbia Black FF Extra)
A green shade of Black, FAST TO ACID, MILLING, also adopted for dyeing of delicate shades of Gray, and for the dyeing of Unions.

KROMEKO FAST BLACK F EXTRA CONC.
(Pre-war prototype: Diamond Black F)
A Chrome Black suitable for METAL MACHINE DYEING, fast to light, fulling, and recommended for raw stock, slubbing and piece dyeing.

AMIDINE DEVELOPED BLACK B H S W
(Pre-war prototype: Diamine Black BH)
Produces a deep bloomy shade of Jet Black when diazotized and developed; suitable for hosiery work and piece dyeing, and having the property of leaving silk white. It is also recommended for Speck Dyeing.

ACEKO BLACK 10B HIGH CONC.
(Pre-war prototype: Napthylamine Black 10B Conc.)
An Acid Black of the highest purity and concentration, suitable for dyeing of worsted material and woolens, giving deep shades of Black with a greenish tone.

Send for Samples and Prices

ESTABLISHED 1876

JOHN CAMPBELL & COMPANY, 75 HUDSON STREET, NEW YORK, N.Y.

American Dyestuff Manufacturers

BRANCHES

BOSTON CHICAGO PROVIDENCE SAN FRANCISCO PHILADELPHIA TORONTO

"STANDARDS EVERYWHERE"

AGAIN AVAILABLE

—WHITTAKER'S BOOK—

"The Testing of Dyestuffs in the Laboratory"

THE eighth importation of this newest and most popular work by Mr. Whittaker has arrived and back orders are now being filled. We have a small surplus which are available for immediate shipment to those who act promptly.

"The Testing of Dyestuffs in the Laboratory" presents in condensed form the results of over twenty years' practical experience. It deals in general with the dyestuff testing laboratory and its functions and in particular with methods for the testing and evaluation of the different types of dyestuff, including the natural colors. Every dye chemist should order his copy NOW to insure early delivery.

PRICE $4.50, POSTAGE PAID

HOWES PUBLISHING COMPANY

4109 Woolworth Building NEW YORK CITY

INDANTHRENES

Your inquiries are solicited for Indanthrene, Helindon, Thio-Indigo, Hydron, Algol and other Vat Colors. The following is a list of some of the more important which we are prepared to furnish from stock or for import:

Indanthrene Yellow GK
Indanthrene Orange RRK
Indanthrene Orange 6RTK
Indanthrene Brown G
Indanthrene Brown R
Indanthrene Red 5GK
Indanthrene Corinth RK
Indanthrene Brilliant Violet BBK, RK
Indanthrene Blue RK
Indanthrene Blue GC
Indanthrene Blue 5G
Helindon Pink R Extra
Helindon Pink B Extra
Helindon Red 3B
Helindon Orange R
Helindon Black Vat T
Algol Brilliant Orange FR
Algol Brilliant Violet R, 2B
Algol Brilliant Red 2B
Hydron Navy Blue C

H. A. METZ & CO. Inc.
One-Twenty-Two Hudson Street, New York City.
Boston Philadelphia Providence
Chicago Charlotte San Francisco

In the dyeing of Wool Felts there are two essentials, one is thorough Penetration and the other is Levelness of Dyeing.

Silk Brown G

answers both of these requirements. Every dyer of Wool Felts should be familiar with this color.

ALTHOUSE CHEMICAL CO.
READING, PA.

The L. B. Fortner Co.
102 Pearl St., Boston, Mass.
Sole Selling Agents for New England.

SOLUBLE WHEAT STARCH BINDER

—A PRODUCT
Made of Pure Wheat

(TO BE USED IN CONNECTION WITH YOUR STARCH)

—INCREASES TENSILE STRENGTH

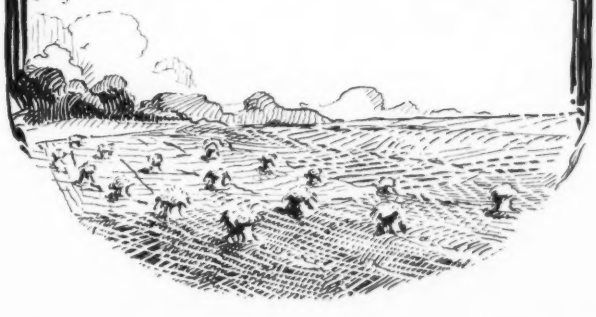
—REDUCES SHEDDING TO A MINIMUM

—PRODUCES A WARP OF IDEAL WEAVING QUALITIES

Soluble Wheat Starch Binder
IS RAPIDLY BEING ADOPTED BY PROGRESSIVE MILLS BECAUSE IT FILLS A LONG-FELT WANT

STEIN, HALL & CO., INC.
61 BROADWAY
NEW YORK
Established 1866

BOSTON
PHILADELPHIA
PROVIDENCE
CHARLOTTE



DYELENE PRODUCTS
Reg. U. S. Pat. Off.

To Users of Developed Blacks

We call attention to the following DYLENE PRODUCTS of which we are the manufacturers:

META TOLUYLENE DIAMINE
Powder or Crystals

DEVELOPER B **DEVELOPER T**

All of Superior Quality and Guaranteed Purity

Samples and Quotations on Request

DYE PRODUCTS AND CHEMICAL COMPANY

200 Fifth Avenue, New York — Works, Newark, N. J.

OUR ACID COLORS

Meet most exacting requirements for colors of this nature to be

FAST TO LIGHT

JENNINGS & COMPANY

INCORPORATED

93 Broad Street — Boston, Mass.

UNITED CHEMICAL PRODUCTS CORPORATION

IMPORTERS, EXPORTERS AND MANUFACTURERS

YORK AND COLGATE STS., JERSEY CITY, N. J.

ANILINE COLORS

ACID DIRECT BASIC

CHROME AND SULPHUR

UCPC

SUMAC EXTRACT

LOGWOOD, HEMATINE,

GAMBIER, FUSTIC, ETC.

CHEMICALS

SOLUBLE OILS, SOAPS, SOFTENERS, SIZES, GUMS AND FINISHES

CHARLOTTE, N. C. ———BRANCHES——— PAWTUCKET, R. I.

Chlorantine Colors

The conspicuous feature of the Chlorantine Colors is their *unusual fastness to light.* For level dyeing, where fastness to acid, alkali, rubbing, and hot pressing are required—THEY ARE UNEXCELLED.

Recommended for application to all goods which must withstand the action of light, such as UPHOLSTERY GOODS, CASEMENT CLOTHS, CURTAINS, VELVETEENS, LINEN, PLUSH, Etc.

Sole Selling Agents for Dow's Indigo and Midland Vat Blues

Sole Representatives in the United States of the SOCIETY OF CHEMICAL INDUSTRY IN BASLE Basle, Switzerland

ciba Co. Inc.
BRANCHES BOSTON PROVIDENCE PHILADELPHIA CHICAGO COLUMBUS, GA.
CEDAR and WASHINGTON STS. NEW YORK

CIBA CO., LTD., Montreal, Canada

F. E. ATTEAUX & COMPANY, Inc.

172-178 Purchase Street, Boston

Sole Selling Agents for

Palatine Aniline & Chemical Corp.

Poughkeepsie, New York

New Product

Empire Coralline—for Wool and Silk

Brilliant color of exceptional fastness to light and milling.

F. E. ATTEAUX & COMPANY, Inc.

BOSTON NEW YORK PHILADELPHIA CHICAGO

ESSEX DYESTUFFS

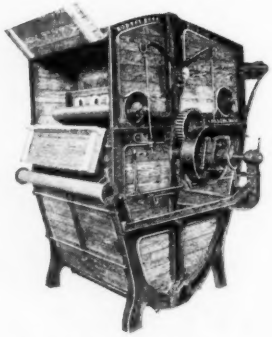
DIRECT YELLOW CF
CHRYSOPHENINE CONC.
DIRECT YELLOW 2G
DIRECT FAST YELLOW B
COTTON YELLOW 5G
DIRECT BROWN 2R
DIRECT BROWN 2Y

DIRECT FAST BROWN M
DIRECT ORANGE R
DIRECT ORANGE 2RE
DIRECT ORANGE 5RE
DIRECT PINK NY
DIRECT PINK 2Y

DIRECT PINK SX
DIRECT FAST SCARLET B
ERICA 2GN
DIRECT ROSE FFB
DIRECT ROSE NB
DIRECT GREEN 2B
CHROME GREEN B CONC.

ESSEX ANILINE WORKS, Inc.
Manufacturers of Aniline Colors.
88 Broad Street, Boston, Mass. Factory at South Middleton, Mass.
The Grasselli Chemical Co., Sole Sales Agents, 117 Hudson St., New York City

STANDARDIZE
on
Rodney Hunt Washers



(Ask for Booklet 221)

Scouring and Rinsing
Woolens, Worsteds, Cottons, Knit Goods

Rodney Hunt Machine Co.
40 Mill Street Orange, Mass.

DH P&B

E. de Haën DH Hannover

ANTIMONY SALTS 65%
BARIUM SULFOCYANIDE
CHROMIUM FLUORIDE
MANGANESE SULPHATE

P&B

IMPORTED

HAZELWOOD DYESTICKS
GLUES AND GELATINES

Sole Agents for the U. S. A.

Pfaltz & Bauer, Inc.
300 PEARL STREET-NEW YORK

P&B DH

HOWES PUBLISHING CO.,
Woolworth Bulding, New York.

.....192...

Please enter my subscription for the American Dyestuff Reporter for one year from date, for which you may bill me $5.00.

.....

....

Canadian Postage $5.50; Foreign $6.00.

.....

Contents of This Issue

March 12, 1923

The Dyeing of Wool (in two parts). I—Preliminary Considerations 199
George H. Johnson, B.T.C.

Improved Method for Sectioning Textiles.. 202
Nathaniel O. Howard and Walter H. Snell

Handy Graphics—VI: Finding Formulas. Regain in Textiles 205
Charles F. Goldthwait and John E. Hoff

Scientific Washing. Part II: Dirt..... 208
F. H. Guernsey

Proceedings of the American Association of Textile Chemists and Colorists:

February Meeting, New York Section... 209

"The Fade-Ometer as a Substitute for Daylight in Testing Dyed Samples for Fastness to Light—A paper by Thomas A. Cassidy 209

Constitution and By-Laws, New York Section 210

Notice of Next Meeting of New York Section 211

February Meeting, Northern New England Section 211

"Perspiration"—A paper by Allan A. Claflin 211

"Package Dyeing"—A paper by W. H. Wingate 213

Discussion of "Perspiration" 215

Discussion of "Package Dyeing" 216

List of Dyes Imported for Consumption Through the Port of New York During January 219

Mussolini Government Appoints Commission to Study Italian Dye Import Tariff 222
Raffaele Sansone

Must Attack Foreign Markets, Garvan Tells S. O. C. M. A. at Second Annual Meeting 224

Editorials:

The Dye Manufacturer's Chance..... 229

J. Emil Frank 229

M. Mussolini and Italy's Dye Industry.. 229

An Apology 230

Inquiry Department 231

Dyeing Wool in Fast Colors..... 232

Bleachers!

Your Selling Agent must cut prices if your product is not superior.

Avoid this by giving him better bleached goods, such as are permanently white without weakening and of greater softness and elasticity.

All this only possible by Solozone-processing.

Ask us how if you don't know.

THE ROESSLER & HASSLACHER CHEMICAL CO.
New York

FLETCHER
ELECTRIC UNDERDRIVEN
EXTRACTORS

OPEN TOP—Access all around basket.
BALL BEARINGS—Low power consumption.
ROTOR ON BASKET SHAFT—No clutches or couplings.

FLETCHER WORKS

FORMERLY SCHAUM & UHLINGER
Glenwood Avenue, at Second Street
PHILADELPHIA, U. S. A.
Other dependable types are belt driven, top motor driven, and steam turbine driven.

I. LEVINSTEIN & CO.
INCORPORATED

281-5 Franklin Street
Boston, Mass.

offer a
full line of
American made
and
British made

DYESTUFFS

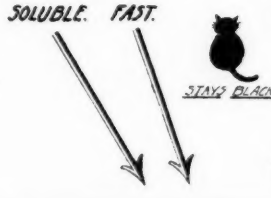
They represent
British Dyestuffs Corporation, Ltd.
Manchester, England
They are introducing to this country

DUROPRENE — *An acid and alkali proof varnish*

VELVONA — *A new inert base and filler*

SULPHUR COLORS

SOLUBLE. FAST. BLOOMY. BRILLIANT.



ATLANTIC PATENT BLACK

ATLANTIC YELLOWS.
ATLANTIC BLUES
ATLANTIC BROWNS.
ATLANTIC MAROONS.
ATLANTIC GREENS.

Economy.
Low percentage is required to produce a deep brilliant black.

Uniformity.
Uniformity of atlantic products can be always depended upon

ATLANTIC DYESTUFF COMPANY
Portsmouth NH
Newyork Charlotte Chicago Philadelphia Providence

TECHNICAL BOOKS

If you are in the market for books on technical subjects — dyeing, finishing, bleaching, etc. — communicate with us and it is probable that we can supply your needs. We shall at all times be glad to submit lists of books covering any special lines.

We call particular attention to

A TEXTBOOK OF DYE CHEMISTRY
By G. VON GEORGIEVICS

This is a new edition of a former volume by the same author. entitled "Chemistry of Dyestuffs," and has been thoroughly revised and brought down to date by Dr. Eugene Grandmougin—translated by Frederick A. Mason. The new edition describes minutely the chemical properties of all dyestuffs, including the natural colors, and contains particularly a new chapter on the Vat Colors

PRICE $12.50

DYERS' MATERIALS
By PAUL HEERMANN

An introduction to the examination, valuation and application of the most important substances used in dyeing, printing, bleaching and finishing. Translated by Arthur C. Wright. Second edition, revised and enlarged by H. B. Stocks. **PRICE $3.00**

HOWES PUBLISHING CO.
4109 Woolworth Building **NEW YORK CITY**

THE BEST DYESTUFFS

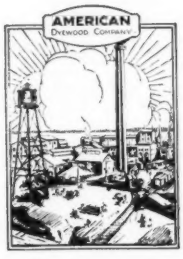
that ever went into a vat cannot produce satisfactory results if there is something wrong with the dye bath or the dyeing machine.

When such problems arise and are difficult to locate or correct, our customers have formed the habit of calling on our service department for help and advice

This department is always at your service to save you time and money. Try it,—there is no charge.

A Full Line of Natural and Artificial Dyestuffs in All Popular Shades

AMERICAN DYEWOOD COMPANY
NEW YORK BOSTON PHILADELPHIA HAMILTON, ONT.
Works at CHESTER, PA.



Established 1798

Will it Fade? Ask the

FADE-OMETER

Standardized Sunlight

THE TEXTILE CHEMIST

finds it a very simple matter to make tests for fastness to washing, to chlorine, to rubbing and to perspiration, but, when it comes to fastness-to-light, he has an almost impossible job on his hands unless he uses the Fade-Ometer.

However, the Fade-Ometer is so rapid and reliable in its action and so conveniently operated that it seems strange any up-to-date plant should continue to put up with obsolete testing methods.

More about the Fade-Ometer and its value to **your** business in Fade-Ometer Bulletin No. 60. Let us send you a copy.

Atlas Electric Devices Co.

364 W. Superior St. **Chicago, Illinois**

New York
F. SCHLAYER
7 Pine St.

London
A. D. LANG, LTD.
4, Vigo St., W-1

QVALITY COLORS
UNITED STATES COLOR AND CHEMICAL CO. INC.

Anthranol Chrome Blue Black AR

Dyes chrome mordant or top chromed. Recommended for fast shades of navy blue or all classes of stock. On account of its shade, level dyeing properties and solubility it is especially suitable for piece dyeing

Anthranol Chrome Brown W

Dyes chrome mordant or top chromed. Is fast to light and fulling. The most level dyeing brown on the market.

Acid Chrome Blue F 4 B

Similar to the pre-war Chromotrope F 4 B. Of special interest for dyeing piece goods to leave silk white.

United States Color & Chemical Company, Inc.

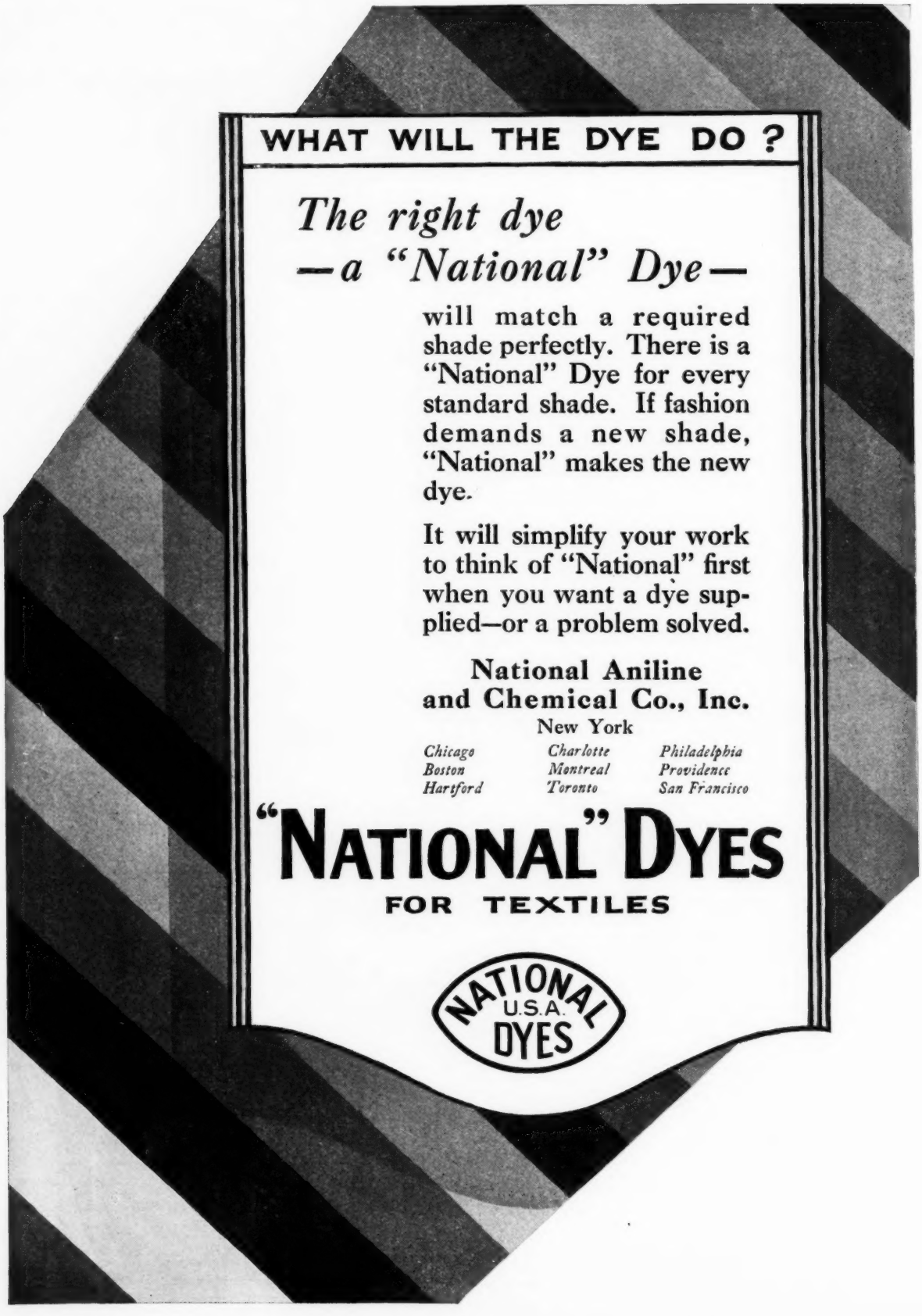
93 Broad St. Boston, Mass.

New York Office: 25 Howard St.

FACTORIES:

NEW ENGLAND ANILINE WORKS, Inc.
Ashland, Mass.

GARFIELD ANILINE WORKS, Inc.
Garfield, N. J.



WHAT WILL THE DYE DO ?

The right dye
—a "National" Dye—

will match a required shade perfectly. There is a "National" Dye for every standard shade. If fashion demands a new shade, "National" makes the new dye.

It will simplify your work to think of "National" first when you want a dye supplied—or a problem solved.

National Aniline and Chemical Co., Inc.
New York

Chicago	*Charlotte*	*Philadelphia*
Boston	*Montreal*	*Providence*
Hartford	*Toronto*	*San Francisco*

"NATIONAL" DYES
FOR TEXTILES

NATIONAL U.S.A. DYES

AMERICAN DYESTUFF REPORTER

"Circulated Everywhere Dyestuffs Are Used"

Devoted to the practical application of dyestuffs in all industries; especially to textile chemistry—the science and practice of scouring, bleaching, dyeing and finishing.

VOLUME XII NEW YORK, MARCH 12, 1923 NUMBER 6

The Dyeing of Wool

(In Two Parts)

Part I—Preliminary Conditions

Consideration of Fastness Requirements—The Importance of Correct Light for Matching—Bleeding Affected by Character of Water—Alkalis—Acids—Proper Choice of Colors—Consideration of Level Dyeing and Exhausting Properties

By GEORGE H. JOHNSON, B.T.C.

WHEN using the term wool, strictly speaking, we confine ourselves to the hair of sheep, but the hair of certain goats and the camel are often included under the same heading. Authorities have distinguished no less than thirty-two different varieties of sheep, of which fifteen belong to Asia, eleven to Africa, four to Europe, and two to America. Naturally, from so many sources we obtain a great many different qualities of wool, which not only differ from one another in length of staple, fineness, elasticity, strength, and color, but also in their behavior during dyeing. Mixed stock, especially when the dyer is unaware of the existence of such a mix, has caused no end of trouble in the trade.

Consideration of Fastness Requirements

In the dyeing operation itself the dyer has a number of things with which he must contend. In the first place, he has to consider the wool fiber itself. Is it perfectly clean? Has all the soap been removed in the rinse after scouring? Do the fibers in question tend to felt easily? If the wool has been carbonized has the acid been neutralized or not? These and countless other questions have to be decided before the dyer may safely take up the operation of dyeing itself.

Next he must determine to what uses the wool, whether in the form of raw stock, slubbing, tops, yarn, or piece goods, is to be subjected, for only after all the facts of the case are known is it possible to proceed on a scientific basis. This known, the dyer is able to choose colors which will prove satisfactory. For example, suppose a batch of wool to be dyed black must be especially fast to milling. The dyer must then use dyestuffs which will meet this requirement, as one of the Diamond Blue Blacks. To substitute a cheaper but more fugitive color would cause no end of trouble and complaint. On the other hand, there is another side of the matter to be considered. It would be equally as foolish to use a very expensive color when a cheaper one will serve the purpose just as well. In the dyeing of hose, for example, the main requirements are fastness to washing and perspiration. Any number of wool dyes meet this requirement, but to use dyestuffs in this case which are also very fast to light and probably more expensive as well would be a sheer waste of money.

The Importance of Correct Light for Matching

If the dyer is attempting to match the sample of a competitor or is making a comparative dyeing he should make his match only under the best of light conditions. Good northern light is, of course, the best to be had, and care should be taken that it is not influenced by other conditions, such as the reflection of a red brick wall. It is well to remember that every dyeing changes its shade according as the light varies. This is especially troublesome when dyeing light and mode shades, when dyeings may pass when examined, say, ten o'clock in the morning, and then be on the green or red side in the afternoon. When making a close match it is also well to examine the dyeings under artificial light, where in most instances a great change is undergone. In countless cases a color combination which was practically perfect in daylight will be far off shade when examined against a competitor's sample under artificial light. The following are a

few rules in regard to colors and the effect artificial light has upon them:

1. A yellow which is on the orange or red side will tend to appear greener in artificial light.

2. An orange which is very yellow red or reddish yellow will tend to appear greener in artificial light.

3. The bluer a red in natural light, the greater is its tendency to appear redder in artificial light. Reds appear more like scarlets, scarlets like orange.

4. Purples often appear more on the crimson side in artificial light. Violets which are red blue or blue red will become redder. Dark violets sometimes deepen to blacks.

5. The more red a blue in natural light the greater tendency it will have to appear redder in artificial light. Navy blues appear like blue-blacks.

6. A green which is very yellow blue will tend to appear greener. Bright greens are intensified.

Fastness to sunlight is a very important consideration, as most woolen and worsted fabrics are subjected to considerable sunlight. Woolen and worsted suitings, overcoatings, caps, sweaters, scarfs, carpet yarns and bunting are examples. Naturally, such articles demand excellent fastness to light. On the other hand, in the case of materials such as hosiery, a medium fastness to light is perfectly satisfactory. When comparing two samples as to their fastness to light, both should possess exactly the same depth of shade; that is, a 3 per cent dyeing on one fabric should be tested against another 3 per cent dyeing and not against one of half that strength, for example. Even under these conditions the results will vary depending on the locality wherein the test was made. A dyeing tested against light in Florida would differ in results from one of the same dyestuff which happened to be tested in Maine. The results obtained would also be influenced by the season of the year. At this point it might be well to differentiate between fastness to light and fastness to atmospheric conditions. The terms are not synonymous by any means. This may well be demonstrated by the following example. A dyestuff which is very valuable to the upholstery trade because of its excellent fastness to light might be useless for bunting, since by its exposure to all sorts of weather it might fade rapidly due to not being fast to water. Finally, it must be observed that such a thing as an absolutely fast dye does not exist and that eventually, if subjected to rain and sunshine long enough, every color will fade perceptibly.

Bleeding Affected by Character of Water

When fastness to washing is required the dyer must again study his colors. A raincoat material must not lose its color in the rain. Colored wool must not bleed into white wool, or mercerized cotton yarn must not bleed into the sizing bath, and mixed woolen yarns must not bleed during steaming. Ladies' dress goods must often stand a slight milling in water without altering the shade, and men's suitings, in many cases, must be able to withstand potting—and so we might continue with still other examples. Chemists have found that bleeding varies with the water, and that rain water has a different effect on dyestuffs than calcareous water. If any alkali has been left in the cloth it often influences bleeding to a great extent. Some dyers will not allow ladies' dress goods dyed with acid colors to be removed from the kettles as long as there are ammonia fumes in the dyehouse. It has been suggested that a slight bleeding of woolen goods may be somewhat moderated by after-treating the dyeing with alum or with acetate of alumnia. When milling in water the addition of a little acid sometimes prevents bleeding.

Alkalis

Again, when determining fastness to alkalis the dyer must consider the uses to which the dyed wool will be put. If the fabric is to be washed and milled he must use the fastest colors available in this respect. Milling and washing have a dual effect upon wool, frictional and solvent. This double action may cause a change in shade, a direct loss of color, or a bleeding into white material present in the piece, unless proper colors are selected. In the case of fabrics which are not to be subsequently washed or milled after dyeing the only fastness requirement in this respect is fastness to street dust, which, of course, is alkaline.

Acids

Behavior of the dyed material towards acids is likewise a point of interest to the dyer. There is but little doubt but that the action of perspiration is acid in its nature, and that the various laboratory tests applied are by no means satisfactory. "The proof of the pudding is in the eating," and the proof of fastness to perspiration is in the wearing. Only under actual conditions are satisfactory results obtained. To be fast to perspiration the dyeing must not alter its shade nor stain white material worn at the same time. In cross dyeing acetic or sulphuric acid are generally employed as the exhausting agent, although formic acid is to be recommended, and as these are very much diluted, if a proper choice of color has been made very little alteration of shade needs be feared. Certain classes of piece goods are often carbonized after dyeing but, while it is true that the shade is often appreciably altered by treatment with vitriol, still in most cases the original color reappears during washing or at least after neutralizing with soda or ammonia. Tests will soon demonstrate whether or not a color is suitable for use on goods which are to be carbonized after dyeing. Needless to say, dyed fabrics should not alter their shade if they should accidentally come in contact with organic fruit juices, which include such acids as acetic, citric and tartaric acids.

Often fastness to rubbing or crocking causes the dyer

a great deal of trouble. All colored fabrics which are intended to be worn in immediate contact with the human skin or with white materials must be especially fast to crocking. Bathing suits and sweaters are examples of goods belonging to such a class. Some colors as a class tend to crock badly as, for example, the basic colors. However, rubbing does not depend entirely on the dyestuff. The cleanliness of the wool to be dyed plays a very important part. Especially when the dyer must use colors applied with the use of chromium salts must the wool be clean. Otherwise it is practically impossible to avoid the defect of crocking. Hardness of water effects some dyestuff, causing a loose fixation of color upon the fiber. At times it is due to incorrect dyeing procedures. When complaints arise all these factors have to be considered from the very start. With woolen goods perfect fastness to rubbing is frequently obtained by washing with fuller's earth, a treatment which removes the superficially fixed dyestuff.

Finally the dyer must consider the influence of heat upon the dyed wool. As is well known, heat plays a very important part in the finishing of textiles; drying, singeing, hot pressing, calendering, and steaming all occur with the aid of heat, either dry or moist. Heat often changes the original shade to quite an extent, but gradually as the piece cools the shade returns. If it fails to do so, the colors which are unable to stand heat should be discarded, and others substituted in their places.

Proper Choice of Colors

Having determined the actual requirements of the fabric the dyer may now proceed to choose suitable colors, build up his formula, and commence the actual dyeing itself. In his choice of dyestuffs he must first consider their solubility, which depends not only upon the nature of the compound but upon the water as well. The danger of adding dye powder or paste directly to the dye bath is obvious to all. While such a practice may be possible in the dyeing of raw stock or even tops, as due to carding and spinning or to backwashing, gilling and further operations the unevenness due to such a practice is more or less offset. When dyeing yarn or piece goods, however, no undissolved dyestuff particles should be allowed to enter the dye bath.

There are any number of methods in vogue for dissolving the acid and chrome colors used in wool dyeing. All methods call for the use of boiling water (basic colors are an exception). Even with the most difficultly soluble dyestuffs 250 parts of water should dissolve one part of color. For easily soluble dyestuffs ten to fifty parts of water will suffice. If soft or condensed water is available for dissolving purposes no difficulties are, as a rule, experienced; hard water, however, must often be corrected before it may be used. Acid colors are often boiled up in copper pails or in steam-jacketed kettles and then sieved before being added to the dye kettles. Some dyers, fearing the sensitive action of copper upon certain dyestuffs, use wooden half-barrels, which are cheaper and serve their purpose fully as well. Sometimes the dye powder is emptied into strong cotton bags, the mouths tied securely, the whole being swished back and forth in the dye liquor until the dyestuff is dissolved. Other dyers partly fill their kettles with water, stir the dyestuff into a paste and pour it into the tubs. The contents are boiled until the whole is thought to be in solution. Cold water is then added until the bath is cooled down to a temperature suitable for commencing dyeing. Such a practice, however, is extremely dangerous for piece goods, especially if the colors being used tend to cake up into sticky, gummy lumps. Chrome colors require considerable care and attention to dissolve them properly. Pastes are stirred with cold water until perfectly smooth and then added to the dye bath through a finely meshed sieve. Powders are stirred into a smooth paste with cold water and then dissolved by pouring boiling water into the container while stirring. Then sieve as before. Certain colors difficultly soluble in water alone, readily dissolve if a small amount of ammonia is added to the water. Gallocyanine is an example of such a dyestuff.

Consideration of Level Dyeing and Exhausting Properties Essential

When making up color combinations the dyer must be familiar with the level dyeing and exhausting properties of the dyestuffs he intends to use. As a rule, dyestuffs which exhaust with difficulty dye more evenly than those which tend to exhaust rapidly. Patent Blue is an example of the first class; Fast Wool Cyanone 3R of the second. A great deal, of course, depends on the acid used and the time taken in reaching the boil. Many acid colors if dyed with Glauber salt and 5 per cent vitriol and brought to the boil in forty-five minutes would produce shaded and cloudy goods, while if dyed with about half as much vitriol and brought to the boil gradually within an hour would give excellent results. For such a reason to use an unknown color without first testing it out is simply inviting disaster. Furthermore, when dyeing with mixtures of colors, as is generally the case, only such dyes should be used together as exhaust in approximately the same degree.

A number of dyestuffs are sensitive to metals. If the batches are to be machine dyed this point must not be overlooked, since a large number of raw stock, top, and yarn dyeing machines are constructed wholly or in part of such metals as copper and iron. Bronze also plays an important part in many types of dyeing machines. Occasionally the dyestuff is reduced chemically by the metal causing a less intense dyeing. In other cases the shade itself is changed, as, for example, a number of acid scarlets are thrown completely off shade and are considerably dulled by copper and bronze. The sensitiveness of a color to copper may sometimes be affected by the addition of ammonium sulphocyanide to the dye bath Usually the machines are treated with ½ per cent ammonium

sulphocyanide and 2 to 3 per cent acetic acid, calculated on the weight of the goods. Add these chemicals to the dye bath, stir well, and allow to stand half an hour. Then add the necessary chemicals and dyestuff and proceed with the dyeing. But in many instances even this precautionary treatment is not satisfactory.

In bringing this part of the paper to a close it might be well to name the three steps which a dyer must take before he can produce satisfactory work:

First, he must collect all available data on the wool he is about to dye.

Second, he must be informed as to what uses the dyed fabric is to be subjected.

Third, he must have a complete and intimate knowledge of the dyestuffs with which he must work.

Only then can be proceed with the actual dyeing operation with any degree of success.

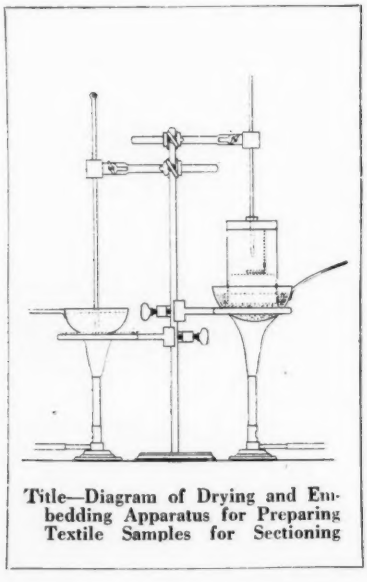
Improved Method for Sectioning Textiles

An Ingenious and Highly Accurate Method by Which Extremely Thin Sections of Textile Fabrics May Be Prepared for Photomicrographic or Microscopic Examination—Particularly Important for Studying Effect of Finishing Processes

By NATHANIEL O. HOWARD and WALTER H. SNELL

Department of Botany, Brown University

STIMULATED no doubt by the activities of the Great War, considerable interest has been shown during recent years in the microscopic study of textile fibers and fabrics. By means of this study it is now possible to identify fibers and fabrics, detect their adulteration, determine the presence of unripe and dead fibers, kemps, mildew and bacteria, and observe the exact angle or irregularities in twist of yarn, the degree of mercerization, the extent and the character of penetration of dyestuffs and sizings, the effect of calendering and other finishing processes to which textiles and fabrics may be submitted. In many cases permanent records in the form of carefully prepared sections or photomicrographs may be obtained often possible to keep a constant check upon many of the processes in the laboratory, the spinning room, and used for demonstration and comparison or filed for future reference. Moreover, by such a study it is the weave shed, the dyehouse, the finishing room and other parts of the mill where textiles are in the making.



Title—Diagram of Drying and Embedding Apparatus for Preparing Textile Samples for Sectioning

For the purpose of such a minute examination, it frequently becomes necessary to prepare extremely thin sections of the various fabrics, which can be mounted upon microscopic slides of glass and studied under the higher powers of the compound microscope. The preparation of these sections requires considerable skill and patience. No general technique has yet been devised that may be applied to all types of examination. Many require a special treatment of the material. Hence a skilled textile technologist must be a microscopist, a physicist, a chemist, and at the some time an artisan. He must be able to apply theory to practice, to discover faults and propose remedies.

Several suggestions for a special technique to be followed in preparing satisfactory sections of textiles have been made. Unfortunately, in the majority of cases, they have met with little success. This is particularly true of many of the methods proposed for the sectioning of cotton fabric, a material which offers peculiar obstacles. In order to section any fabric, however, whether it be of cotton, linen, wool, silk or other textile, it is absolutely necessary that the individual fibers be securely held in their proper relations with reference to one another during the sectioning and mounting processes. Hence they must be properly embedded in a tough, firm but not brittle matrix. For this purpose celloidin, cellulose acetate,

paraffin, gelatin, gum arabic, glue, agar, and several other substances of a similar nature have been employed. The standard methods of the histologist must often be modified, however, since they make use of certain solvents which, when employed for the study of textiles, might seriously interfere with or actually defeat the end in view. In connection with certain experiments to determine the distribution and extent of penetration of the various classes of dyes in cotton fabrics the senior writer has developed a modification of the paraffin method which he believes may have a much wider application in the microscopy of textiles.

Preparation of Paraffin Matrix

The standard paraffin method well known to the animal and plant histologist or pathologist is a long and tedious process, requiring from ten to fourteen days for its completion. In order thoroughly to infiltrate the material to be sectioned with the embedding substance it is necessary that the contained water be entirely removed. This is accomplished by careful dehydration, using for this purpose a series of alcohols ranging from 5 per cent to 100 per cent. In the case of colored fabric it can readily be seen that the use of alcohol, which is an excellent solvent for the majority of our organic dyes, may modify the distribution and perhaps completely remove the coloring agent from the textile. To obviate this difficulty and at the same time secure a satisfactory dehydration Lee and Hoxie employed moderate heat in place of alcohol. They made use of the drying oven commonly found in testing laboratories, and maintained, for a comparatively short time, a temperature a little above the boiling point of water, i. e., 212 deg. Fahr. (100 deg. Cent.).

Description of Apparatus

With this and other modifications of the standard paraffin method made by the senior writer and herein described it is now possible to prepare, permanently mount and have under the microscope for examination, sections of fabric within an hour from the time samples are received in the laboratory. Hence the method becomes of real practical value as a means of keeping check upon the several processes to which the fiber or fabric is submitted. It also finds ready application in the study of many allied processes such as occur in the manufacture of paper, cordage, twine, leather, and many other industrial products. It is not applicable in the study of soft, succulent material such as fresh animal or vegetable tissue. Those investigations properly come within the sphere of the histologist or pathologist.

According to this method, a small piece of the material to be studied, for example, cotton or woolen cloth, is first cut into a few squares perhaps three-sixteenth of an inch on a side, the edges being parallel to the warp and filling respectively. These squares are then placed in an oven and dried at a temperature of 230 deg. to 240 deg. Fahr. (110-115 deg. Cent.) for approximately fifteen minutes. An oven which provides for free circulation of air is to be preferred. The writer constructed such an oven out of a metal baking powder can by punching two one-quarter inch holes in opposite sides of the can, one about an inch above

Part of Section of Dyed Cotton Dress Goods, Showing Cotton Fibers of Warp in Cross-Section. Thickness of Section, 1/5,000 Inch.

the bottom, the other about an inch below the top. A hole three-quarter inch in diameter was punched in the cover and into this was fitted a perforated cork holding a chemical thermometer. A false floor made of a folded piece of iron gauze was fitted into the can at a point about one and one-half inches from the bottom. The can was then placed in an iron pan and partly submerged in sand, i. e., until the bottom was buried to a depth of three-quarters of an inch. When this improvised oven with its sand bath had been placed upon the ring of a ringstand and over a Bunsen burner the cheap yet satisfactory drying apparatus was complete. For convenience in handling the cloth squares it was found advisable to use a ladle of one-eighth inch mesh wire gauze, one inch wide and five inches in length, bent into a letter L with the horizontal limb perhaps seven-eighths inch long and supporting a seven-eighths inch square of glass. Upon this glass the squares were arranged and the ladle placed in the can. At the expiration of a drying period lasting for perhaps ten to fifteen minutes, the

ladle with its cloth samples was removed. The samples were then transferred by means of steel forceps to melted paraffin at 230 deg. Fahr. (110 deg. Cent.) contained in a porcelain casserole. A mixture made by melting together equal parts of 52 deg. Cent. and 58 deg. Cent. paraffin gave the best results. The temperature (230 deg. Fahr., 110 deg. Cent.) was maintained by carefully regulating the Bunsen flame, frequent readings being taken by means of a second chemical thermometer with bulb submerged in the heated fluid. Two carefully adjusted thermostats, in place of the thermometers, are to be preferred in that they will maintain constant temperatures without attention on the part of the operator.

Important Details of Process

To facilitate matters the writer has found it best to prepare small molds of ordinary foolscap paper folded in to boxes three-sixteenths by three-quarters by three-quarters inch. These boxes are then submerged in the melted paraffin contained in the casserole and allowed to remain there while the sections are being dried in the oven. Moisture and air within the paper are driven out by the heat of the bath thus preventing the formation later on of bubbles in the embedded fabric. At the end of the ten to fifteen minutes drying period the cloth samples are removed from the oven by means of forceps and placed one at a time in the paraffin contained within the boxes. One section only is placed in a box. Here they are allowed to remain for perhaps fifteen minutes, a length of time sufficient for a satisfactory penetration of the cloth.

While the material is undergoing the embedding or penetration treatment, one or more depressions perhaps sone by one by seven-eighths inch deep should be formed by means of a hot iron in the upper surface of a cake of ice. The paper boxes containing melted paraffin and samples are now transferred one at a time, from the paraffin bath to the ice water contained in these depressions. Heated forceps are best for this purpose. To prevent crystallization of the paraffin, which would later interfere with a satisfactory sectioning of the fabric it is important that it be cooled rapidly. Hence the use of ice water. While the lower portion of the paraffin is cooling the sample cloth square may be held, by means of heated forceps, in a vertical position with the lower edge parallel with the bottom of the paper mold. After a minute or two the forceps may be removed. When the shiny surface of the melted paraffin contained in the mold assumes a dull appearance, the mold may be dipped in a larger quantity of ice water and left further to cool. As soon as the paraffin has become sufficiently hard the enclosing paper may be cut away by means of a scalpel or sharp knife. The block is then trimmed to rectangular form in such a manner that the plane of the cloth is parallel to the sides and the lower edge parallel to the bottom of the block.

Freezing Microtome Essential

In this condition the blocks may be preserved indefinitely or may be transferred immediately to the freezing head of a freezing microtome of either the carbon dioxide or ether type. The use of a freezing microtome in combination with the paraffin process is the important development in securing thin sections of textiles.

A few drops of a 10 per cent solution of gum arabic in water, containing 0.5 per cent phenol as a preservative, is first added to the freezing head. The paraffin block is then placed in this liquid and freezing begun. More of the gum arabic solution is added from time to time to the sides of the block. When frozen it forms a firm adhesive shell about the lower portion of the block and securely holds it in position. This operation may require but a few minutes. By regulating the amount and duration of the ether or carbon dioxide spray it is possible to control to a considerable degree the hardness of the paraffin. Frequent tests with the microtome knife will enable the operator to judge the proper degree of hardness to be used with a certain thickness of section. Too low a temperature results in a brittle condition of the paraffin while, as everyone who has had experience with the cutting of sections knows, too high a temperature makes the paraffin so soft that it fails to hold the embedded material in position. The knife is now set (with a slight inclination toward the cutting edge) at a comparatively small angle to the line of cutting. This angle largely depends upon the type of microtome employed as well as the character of the material to be sectioned. Sectioning may be continued as long as necessary, but it will be found advanageous to clean the knife from time to time with a small wad of cotton moistened with 95 per cent alcohol.

Permanent Mounting of Sections

It should be borne in mind that it is absolutely impossible to cut satisfactory sections unless the knife be exceedingly sharp and free from nicks. The senior writer has found that a preliminary honing upon a Belgian hone, followed by careful stropping upon a mounted leather strop previously rubbed with crocus gives a very satisfactory edge to the knife. Sections may be removed by means of a camel's-hair brush and immediately floated upon water at 70 deg. Fahr. (21 deg. Cent.) contained in a watch glass. It is not necessary that they be kept perfectly flat, for even closely rolled sections if thin will eventually unroll on the comparatively warm water of the watch glass.

To mount the sections permanently it has been

(*Concluded on page* 221.)

Handy Graphics—VI

Finding Formulas—Regain in Textiles

Formulas for Experimental Results Easily Derived on Ratio Ruling—New Formulas for Textile Regains

CHARLES F. GOLDTHWAIT
Baltimore Processing Company, Baltimore, Md.

and

JOHN E. HOFF
Klearflax Linen Looms, Inc., Duluth, Minn.

Part Six of a Series on Textile Chemical Uses of Ratio Paper and Logarithmic Scales

ONE of the most interesting uses for the two types of log paper is the derivation of approximate formulas to fit experimental results. This is made easy for certain types of work because data which give actual curves on ordinary paper are found to form straight lines on ratio or "double log" sheets.

A matter of very general interest to textile chemists is the regain or absorption of moisture by textiles from the atmosphere. As is well known, this depends mainly on the relative humidity of the air. Various tables and formulas (9, 10, 11) have been given and the humidity point of view has been widely adopted in manufacturing and trading in textiles.

In a search for a fairly simple formula to express approximately the per cent regain from a given per cent relative humidity the writer hit upon the following method, which will also serve as a convenient example of this type of graphical work:

Charting the Regain

Starting with a reprint of Schloesing's tables (9) for cotton and taking values for every 10 per cent humidity, we get Table 1 whose data plotted on ordinary paper gives *Fig.* 1A. The part of greatest significance is considerably curved. *Fig.* 1B shows the same data on ratio paper. The most important part of the curve is almost a straight line, and straight lines are easily treated mathematically.

TABLE 1
SCHLOESING REGAINS FOR COTTON

Per Cent Relative Humidity	Per Cent Regain 54° Fahr.	75° Fahr.	95° Fahr.
10	2.57	2.50	2.40
20	3.80	3.58	3.46
30	4.70	4.40	4.20
40	5.53	5.15	4.86
50	6.32	5.92	5.60
60	7.30	6.80	6.47
70	8.62	8.00	7.62
80	10.78	10.00	9.35
90	15.00	14.07	13.00

Since the curves are actually curved a little, care is required in choosing the section of most practical value. Numerous statements have been made of the best humidity conditions for manufacturing.

A recent writer (8) gives the conditions for woolen manufacture as—

	Temperature Fahr.	Relative Humidity
Carding	75° to 80°	65% to 70%
Spinning	75° to 80°	55% to 60%
Weaving	70° to 75°	50% to 55%

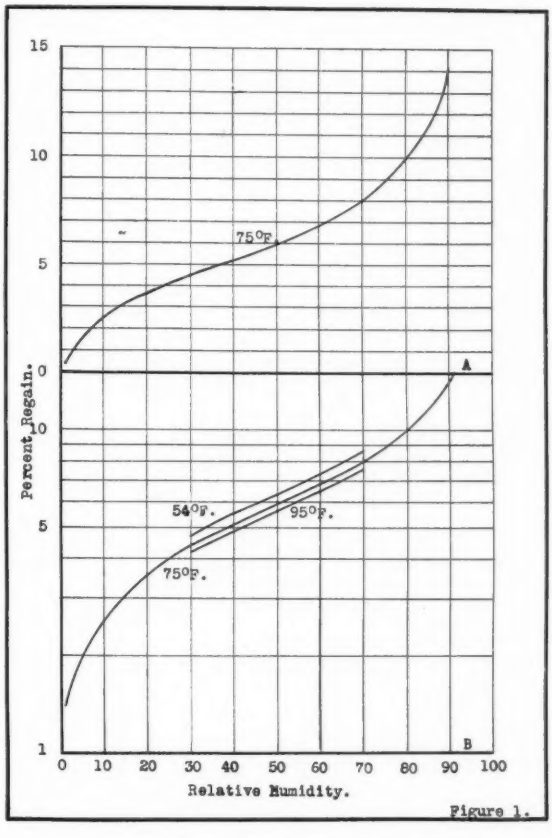


FIG. 1—*Comparative Plotting of Regain*

Another writer, quoted by Hartshorne (1), gives the figures for cotton—

	Temperature Fahr.	Relative Humidity
Carding	68° to 77°	50% to 55%
Spinning	68° to 77°	55% to 70%
Weaving	68° to 77°	65% to 70%

From these it is seen that the range 50 to 70 per cent should cover normal work. The nearest straight line through these values is found to cover very closely everything from 25 to 75 per cent, as shown in *Fig.* 2 on ratio paper.

Finding the Formula

Now the equation for such a straight line is $y = mx + b$.

Since, however, our line is on ratio paper, it is represented by $\log y = \log b + \log m$, which represents a formula of the type $y = bm^x$, where b and m are constants.

The value of constant b is found by simply noting the intercept at the left. The distance is actually log b but on ratio paper we read b direct as 2.68.

The slope is the value of log m, and here we come upon an interesting point that does not show in the graph. On the original chart the length of the cycle was 3¾ inches but actually represents 1, the difference between log 1 and log 10. To be drawn completely to the same scale, the chart would have been 375 inches or over 31 feet long. With this in mind we find log m equal to the slope (the distance a in inches) (as measured on the chart) divided by 375 (2.59 ÷ 375). This works out 0.00651 and from a log table m is found to be 1.016.

Quantity x is the abscissa of any point on the line and can be conveniently expressed in per cent relative humidity, written as whole numbers.

Our final formula reads, for 75 deg. Fahr.:

$$y = 2.68(1.016)^x$$

To find the regain for 60 per cent relative humidity at 75 deg. Fahr., solve $y = 2.68(1.016)^{60}$ and get 6.96 per cent, which checks very closely with 6.93 per cent read from the straight line and 6.8 per cent read from the original curve. The solution is easily made by the aid of a log table.

The error of the method is readily estimated from the curve and is seen to be about 0.2 per cent of regain (at the maximum), between 25 and 75 per cent relative humidities for this temperature.

In other words the accuracy is good enough for all practical purposes, the error being no greater than the variations in different parts of an ordinary room, certainly within the degree of control in average plant, and probably within the accuracy of thermometers and other instruments used.

For the case described—

TABLE 2

Relative Humidity %	Schloesing's Value %	Calculated from New Formula %	Actual Difference
70	8.00	8.16	0.16
60	6.80	6.96	0.16
50	5.92	5.94	0.02
40	5.15	5.07	0.08
30	4.40	4.32	0.08

To sum up, we have derived a simple formula for the working portion of a rather complex curve which represents in turn a very complex phenomenon.

At other temperatures, the curves for cotton are slightly higher or lower on the sheet as shown at *Fig.* 1B and their formulas will have slightly different constants.

For humidities within the range 25 to 75 per cent relative, we find for y plus bm^x—

At 54 deg. Fahr. $y = 2.82(1.0163)^x$
At 75 deg. Fahr. $y = 2.68(1.01605)^x$
At 95 deg. Fahr. $y = 2.55(1.0150)^x$

The quantity m is for all practical purposes constant through the whole range of 41 deg. Fahr., while b varies roughly in inverse proportions to the temperature.

For Other Fibers

Data for wool and silk give curves similar to that for cotton.

A series under fairly comparative conditions gave the formulas—

Cotton ..... $y = 2.68(1.01605)^x$
Silk ..... $y = 4.4(1.0138)^x$
Wool ..... $y = 6.54(1.0124)^x$

The b factor changes considerably while m is fairly near a constant for the different fibers.

As far as known, the data used for deriving the above formulas are the direct results of experiment and are reasonably correct but since this paper is intended more as an illustration of a graphic method than a discussion of humidity and regain they have not been critically investigated and the reader should carefully select his data and derive his own formulas to fit.

Very similar relations have been noticed for the moisture absorbed by flour and it is probable that the same methods can be applied to paper and many other

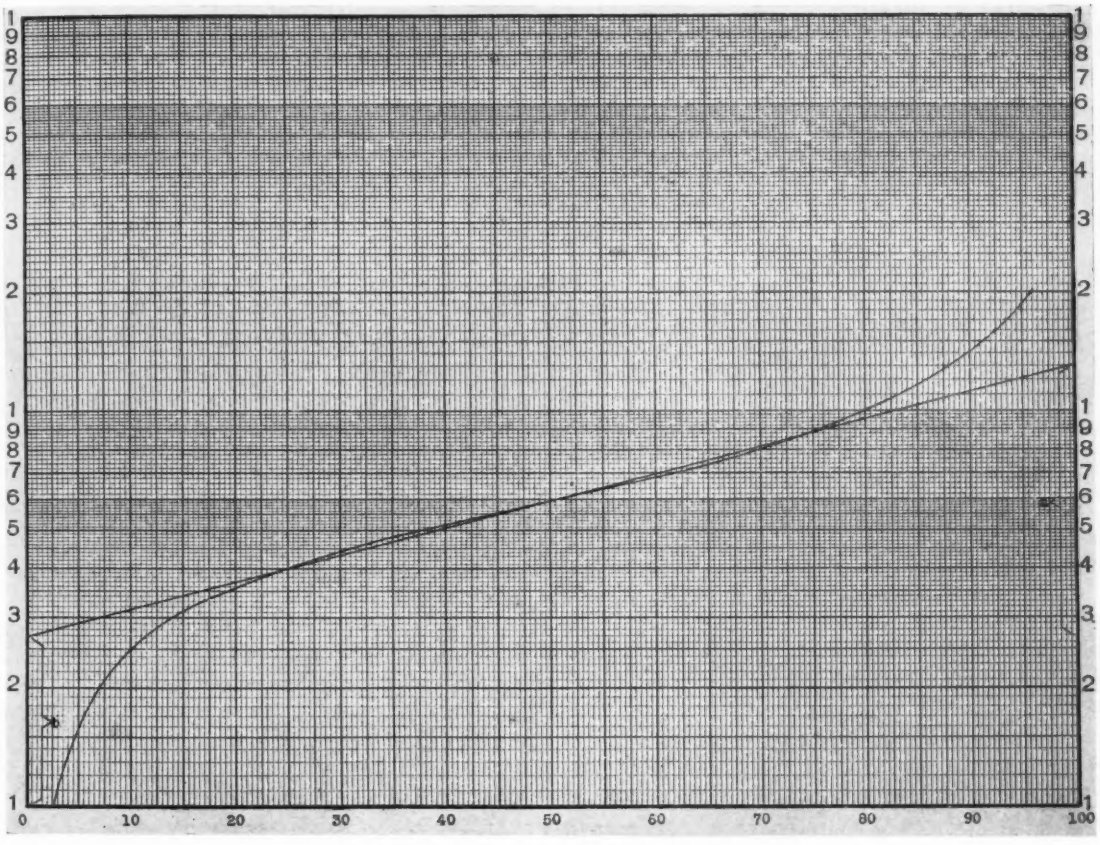


FIG. 2—*For Deriving the Formula*

materials that are affected by moisture in the air, as a large number of these (12) have curves of the same general type as textiles.

It is also interesting to note that the curves are of the same shape as the "general adsorption isotherm" as shown for instance in Washburn's "Principles of Physical Chemistry." It is, therefore, quite possible that this general method may find an application in the study of the "theory" of dyeing, for dyeing as well as regain is an adsorption phenomenon.

As an aid to readers who may be interested in atmospheric humidity as related to regain of textiles a few good references are included.

(1) "How to Make and Use Graphic Charts." Allan C. Haskall. Codex Book Company, New York.

(7) "Empirical Formulas." Running. Published by Wiley, 1917.

(8) "Humidity in Woolen and Worsted Mills." A W. Thompson. Textile World, November 18, 1922.

(9) "Research on the Hygroscopic Properties of Various Textile Materials." M. T. Schloesing, Jr. Bul. Soc. d'Encouragement pour l'Industrie Nationale. 1893. Tables reprinted in Textiles, 1919.

(10.) "The Moisture Content of Textiles and Some of Its Effects." William D. Hartshorne. Paper presented before A. S. M. E., December, 1917.

(11) "Some New Forms of Hygrometric and Regain Tables and Comments Thereon." William D. Hartshorne. Bul. National Association of Wool Manufacturers. October, 1921.

(12) "Humidity Equilbria of Various Common Substances." Wilson and Fuwa. J. I. E. C. 14,913 (1922).

(13) "The Humidification and Cooling of Textile Mills." L. Sconfietti in Textile Manufacturer, 1903.

(Part VII, concluding this series, will follow in the March 26 issue.)

ESTERIFICATION OF DISPERSED CELLULOSE

Plausons, Ltd., and H. Plauson. Chem. Zentr., 1922, iv, 1806 (from E. P. 183,908), through Jour. of the Textile Institute:

Cellulose phosphate can be prepared by warming an aqueous dispersion of cellulose, obtained by means of the colloid mill, with phosphoric acid and a little sulphuric acid. Cellulose acetate is similarly obtained by using acetic anhydride and acetic acid, while cellulose methyl ether is obtained by passing gaseous hydrochloric acid into dispersed cellulose to which methyl alcohol has been added.

Scientific Washing

II—Dirt

Dirt, Accidental and Intentional—Influence of Textile Fiber on Dirt—Classifying Dirt—Substances Soluble in Water—Substances Insoluble in Water—Stains

By F. H. GUERNSEY

Chief Chemist, the Cowles Detergent Company, Lockport, N. Y.

Dirt

THE difference between clean linen and soiled linen is a matter of imprisoned dirt. One of the largest industries of America has developed in the separation of this dirt from the linen of America's millions. A modern steam laundry is an asset and a credit to its community.

In this series of washroom discussions a study is being made of the materials used for dirt removal, together with the principles upon which they function. But our knowledge of detergents cannot be put to fullest use until we also understand the character of substances called dirt. Generally speaking we all know that when our hands or our clothing become soiled, the application of soap restores cleanliness. Here and there a laundry is opened with little more information on the science of washing than this elementary fact. In such plants the stains or dirts that do not give up the ghost in the "suds" get a stiff dose of bleach, and if they still show their unwelcome presence they are treated to a sour. Persistence of the spot after this series of prescriptions simply means, to the "suds—bleach—sour" boys, another application, double strength. By this time the influence of the "medicine" may have had the effect of endangering the goods or filling them so full of chemical precipitates as to suggest that they might as well have been left dirty so far as quality standards of laundering are concerned. Fortunately, the superior results in the modern laundry quickly drive such a plant out of business or force it to adopt intelligent practice.

So let us proceed to study that most common substance in the universe—D-I-R-T.

Accidental and Intentional Dirt

The word "dirt" is a term broadly used to designate *any* foreign substance or material which attaches itself to a given object, and whose presence in contact with the object is, for one reason or another, undesirable.

Most dirt on goods coming to the laundry is obviously of accidental origin, but there are cases where the "dirt" has been purposely added. For instance, starch, as found in collars, shirts, etc., has been intentionally placed there, but is classed as dirt at the time of re-wash and is removed as such. In the textile industry, oils, sizings, etc., are continually used on the yarns, and in many cases must be removed as "dirt" before dyeing, bleaching, etc. Lime soap, which attaches itself to goods during a wash in water carrying hardness, is truly a form of dirt.

There is also a certain amount of what is termed "occupational dirt," that is, clothing from painters, garage workers, machine shop workers, butchers, kitchen help, etc., the dirt being more or less specific in each case. Of course, this is a class of "accidental" dirt.

The launderer is concerned chiefly with accidental dirt. This discussion, however, will consider the nature of dirt as he finds it; how, when and where. The means and methods by which he must remove it are covered by other chapters.

Washing Means "To Subtract Dirt"

The common effect of dirt is to discolor or "soil" the object with which it is in contact; the object, in the launderer's case, being a textile fabric composed of a multitude of textile fibers.

The launderer's problem when reduced to elementary form is a simple one of subtraction, based upon a previous example of addition which may be represented as follows:

Clean bright garment + Dirt = soiled unattractive garment.

The customer demands a clean bright garment from the laundry; therefore, the launderer must solve the above equation for "clean bright garment." The knowing launderer looks at it, and solves his problem this way:

Soiled unattractive garment — Dirt = clean bright garment.

He realizes that there is only one way to restore the garment to its original condition and that is to *subtract* the dirt—actually remove it; not to remove part and whiten the balance with bleach; nor to hide dirt with blue.

Looking at the matter of washing in this light simplifies it considerably, but the operation is not always as easy as it looks, for the term "dirt" covers a multitude

(*Continued on page* 217.)

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

President
LOUIS A. OLNEY
Lowell Textile School, Lowell, Mass.

Vice-Presidents
WILLIAM D. LIVERMORE WILLIAM H. CADY

Secretary
WALTER E. HADLEY
5 Mountain Avenue, Maplewood, N. J.

Treasurer
WINTHROP C. DURFEE
516 Atlantic Avenue, Boston, Mass

Councilors
ELMER C. BERTOLET GEORGE A. MORAN
ARTHUR E. HIRST WILLIAM K. ROBBINS
WILLIAM R. MOORHOUSE WALTER M. SCOTT

LOCAL SECTIONS AND THEIR OFFICERS

Northern New England Section—
Hugh Christison, Chairman, Arlington Mills, Lawrence, Mass.
A. K. Johnson, Secretary, Lowell Textile School, Lowell, Mass.

Rhode Island Section—
Ralph F. Culver, Chairman, Box 269, Providence, R. I.
Leslie L. Bamberger, Secretary, U. S. Finishing Company, Providence, R. I.

New York Section—
P. I. Wood, Chairman, Oriental Silk Printing Company, Haledon, N. J.
L. C. Lewis, Secretary, 95 Madison Avenue, New York City.

Philadelphia Section—
Robert E. Rose, Chairman, E. I. du Pont de Nemours & Co., Wilmington, Del
Elmert C. Bertolet, Secretary, Philadelphia Textile School, Philadelphia, Pa

FEBRUARY MEETING OF THE NEW YORK SECTION

The February meeting of the New York Section of the American Association of Textile Chemists and Colorists was held Friday evening, February 23, at the offices of the Tinc Tura Laboratories, Inc., Brooklyn, N. Y.

The subject assigned for the meeting was a demonstration and discussion of the Fade-ometer as a substitute for daylight in testing dyed samples for fastness to light. Thomas A. Cassidy led the discussion and by way of introduction read a prepared paper, as follows:

THE FADE-OMETER AS A SUBSTITUTE FOR DAYLIGHT IN TESTING DYED SAMPLES FOR FASTNESS TO LIGHT

By THOMAS A. CASSIDY

In the way of an introduction, I wish to state that the observations to follow are of necessity general in nature. The subject of fastness to light and the means of ascertaining the same are so great that, despite our hundreds of exposure tests both to the sun and to the Fade-ometer arc, I would hesitate to make any sweeping assertions as to the adoption of the lamp as a standard for the testing of colors, in whatever form applied, to sunlight fastness.

The colors that we have tested range from the fugitive basics to the faster colors of the Anthraquinone class. The products, for the most part, have been those submitted by clients, and for that reason our results are expressed in terms of fastness of a color of definite chemical constitution, the original manufacturer of the colors not being known.

The results obtained by the use of the Fade-ometer have agreed in general very well with those of New York sunlight; that is to say, a sample falling into one of four or five classes usually designated by the terms Poor, Fair, Good, Excellent, shows the same relative fastness in the two sources of light. The discrepancies noted have been of two kinds: one, the change of shade has varied; the other, the actual fading has differed. The last can be illustrated by Schultz and Julius, No. 41 (Fast Acid Fuchsine B of Bayer). By the top chrome and chrome bottom method the results with the lamp show the top chrome dyeing to be somewhat faster, while the sun shows the same fastness by both methods. This apparently grave fault does not put either of the results obtained by different dyeing methods in another class. The difference in shade caused by that of the sun and the arc has never been such as to cause a change in opinion as to its adaptability.

Still another difference is the rate of fading upon different products: that is, compared with sunlight; which, although great when considered alone, become normal when a comparison is also made of more than one source of sunlight. With this rate of fading reduced to a known quantity as against sunlight of a carefully measured quantity, quality and all atmospheric conditions that enter in, much progress will have been made in clearing away the uncertainty that is associated with this means of testing.

The Fade-ometer has one strong point in its favor, and that is the fact that a result obtained at any time can be duplicated in regard to fade, shade change, and time of exposure necessary to produce the same. We have had, on occasion, to test the same chemical product as many as fourteen times; whether any of these fourteen were duplicate products from the same manufacturer is not known, but in all cases the time necessary to produce fading and shade changes was the same, within limits allowed the human eye.

The lamp itself is of the enclosed arc type used in conjunction with a special carbon electrode. Provision is made for the exposure of forty tests at one time, and the time necessary to produce a fade varied from 20 to 215 hours in colors we have tested. In practice we have found it advisable to renew the carbons every 24 hours, although the actual life of the carbon is more than 30 hours. The carbons are the only parts that have called for replacement since the installation a year ago.

The spectroscope shows the Fade-ometer light to have a line spectrum which, in the blue and violet, closely approaches that of sunlight, but in the longer wave lengths there are some comparatively wide gaps. The fading power of these longer radiations is said to be slight.

In the ultra-violet, to quote Mr. Weightman of the Fade-ometer Company, is found 80 per cent of the effective radiations present in sunlight.

We find that the lamp, operating on 220 volts direct current at 8 cents per kilowatt-hour, shows an operating cost of 24½ cents per hour, including carbons.

At the risk of making the talk anaemic, I have eliminated all but the skeleton; and this for two reasons, one of which is the presence in this Section of many users of the Fade-ometer, to whom much of the detail would be repetition; the other the inability to do justice to any one series of colors in the course of an evening's discourse. I believe the discussion to follow will add much of value and interest.

At the conclusion of Mr. Cassidy's paper the meeting adjourned to an upper room, where a Fade-ometer is installed, and half an hour or so was spent in examining the lamp and discussing its properties, which were explained by Mr. Cassidy and others present who were familiar with its use.

The meeting was reassembled formally and listened to the report of a committee composed of Messrs. Hadley and Grandage, who had been requested to draft by-laws for the Section. After considerable discussion and various amendments the by-laws were adopted as follows:

CONSTITUTION

The work of the New York Local Section shall be carried out under the terms of the Constitution of the American Association of Textile Chemists and Colorists.

BY-LAWS

I—Officers

The Officers shall consist of a Chairman, Secretary and Treasurer to be elected at the regular May meeting, to hold office for one year.

Section 1. The Chairman of Local Section shall preside at all meetings of the Section, appoint all special committees and in general perform all the duties incident to the office.

Sec. 2. In the absence of the Chairman the Treasurer shall preside at the meetings of the Section and shall perform all the duties of the Chairman.

Sec. 3. The Secretary shall keep the minutes of the meetings of the Section, issue notices of all meetings and conduct the correspondence and keep the records of the Section. He shall perform such other duties as may be assigned him by the Chairman or as may pertain to his office. His records shall be open to the inspection of the Council at all times. A yearly report shall be rendered the Secretary of the parent association prior to December 1.

Sec. 4. The Treasurer shall collect all assessments and other moneys, pay all bills approved by the Chairman, and keep a record of same, and shall make a yearly written report to the Treasurer of the parent association prior to December 1. His accounts shall be audited at least once a year.

Sec. 5. The Chairman is authorized to hold a special election at a regular monthly meeting, to fill any vacancy which may occur.

II—Committees

Section 1. There shall be standing committees on Program and Entertainment.

Sec. 2. Duties of committees:

(a) The Program Committee shall arrange and have charge of the programs of the monthly meetings.

(b) The Entertainment Committee shall, with the approval of the Section, arrange for the accommodation and entertainment of the members of the Section.

III—Meetings

A regular meeting of the Section shall be held on the fourth Friday of each month, except June, July and August.

IV—Amendments

These By-laws may be amended at any regular meeting by a two-thirds vote of those voting, two weeks' notice of proposed amendment having been

sent to each member. Proposed amendments must be signed by 10 per cent of the members of the Section.

The committee which had been appointed to investigate possible meeting places where dinner could be served reported on several available restaurants, and after some discussion it was decided that the next meeting, which would be held Friday evening, March 23, would be held at Stewart's, 30 Park Place, New York City, at 7 o'clock, where dinner would first be served to the members, to be succeeded by the regular meeting.

There being no further business to come before the meeting, it was adjourned at 10 p. m. About thirty-five members were present.

L. C. Lewis, Secretary.

NEXT MEETING OF THE NEW YORK SECTION

The regular March meeting of the New York Section will be held at Stewart's Restaurant, 30 Park Place, New York City, on Friday evening, March 23. A dinner at $1.50 per plate will be served, after which Dr. Oscar R. Flynn will address the members on "The Use of Titanium in Testing Dyes."

The April meeting will be addressed by H. Clapham, on the subject "Some Dyeing Machines I Have Seen and Used, with Special Reference to Dyeing Wool Tops."

L. C. Lewis, Secretary.

FEBRUARY MEETING OF NORTHERN NEW ENGLAND SECTION

A regular meeting of the Northern New England Section was held at the Engineers' Club, Boston, Mass., on Saturday, February 17, 1923, with about fifty members in attendance.

The program for the evening consisted of two papers, the first, on "Perspiration," presented by Allan A. Claflin, of the L. B. Fortner Company, and the second, on "Package Dyeing," given by W. H. Wingate, of the Franklin Process Company. An interesting general discussion followed the two papers.

Mr. Christison, Chairman of the Section, in opening the meeting to Mr. Claflin made a few preliminary remarks as to the trouble caused by perspiration and to the general uncertainty as to what its physical and chemical action was.

Mr. Claflin presented the following paper:

PERSPIRATION

By Allan A. Claflin

My purpose is to talk to you to-night not so much, as the notice states, on the effect of perspiration on dyestuffs, but simply on perspiration. Perspiration, or, to give it its good old Anglo-Saxon name, sweat, has been a subject, considering its importance, too much neglected by physiological chemists.

It is interesting to note this change in name from sweat to perspiration. It is relatively new; indeed, the change in name is about the only new thing that has happened in regard to sweat in the last forty or fifty years. It is more refined, perhaps; more euphonious, perhaps; it is certainly more American to speak of perspiration rather than of sweat. The English, either because they are more conservative or more inclined to call a spade a spade, still have a tendency to call sweat sweat. This digression in regard to the name of the subject of this talk is of interest only because it may save you some time if you are looking up the subject in an English reference work, and because it has a certain chronological significance.

What the physiological chemistries have to-day, when they have anything about perspiration, is about the same as they had forty years ago about sweat. Oh, now and then some inspired genius has contributed something. Perhaps the most recent observation generally recorded or quoted is the depression of the freezing point of perspiration as compared with pure water. I am not fussy about facts concerning perspiration—my greatest complaint is their fewness—almost any accurate observation would have interest; but it does seem a little hard that about the only even fairly recent observation is that in regard to the depression of the freezing point, which is a variable within wide limits, is purely a question of concentration, and could be predicted from analytical data much more accurately than there is any apparent necessity of knowing. Now, I have made some pH determinations—I am going to check them further before I publish them—but in a large degree the pH value is independent of the concentration. Perhaps I should say here, for the benefit of those who are more occupied in doing things than reading chemistry, that the pH value, the modern method of expressing the concentration of the hydrogen ion, is to the up-to-date chemist what the slide rule is to the recently graduated engineer. We used to know simple facts—for example, that sulphuric acid is a stronger acid than acetic; now we know that is so because in solution it has a very much higher hydrogen ion concentration. Speaking generally, and of acid solutions, it may be said that solutions of the same hydrogen ion concentration behave chemically and physically similarly.

For convenience in plotting curves, since hydrogen ion concentration values have as wide differences as pre-war and post-war European currencies, it is becoming customary to report hydrogen ion concentra-

tion values in terms of the reciprocal of the logarithm, thus:

$$pH = \frac{1}{\text{Log H—}}$$

I dwell on this a little more for its general interest than its immediate pertinence to perspiration, but you will see more and more references to pH values. In the literature it took me a considerable time to find out what it meant, and for the benefit of those of my generation I am making this explanation. Of course, the young men present know all about it anyway.

However, while I am not satisfied with my pH values for perspiration, and particularly the limits within which they may vary, suffice it to say they are relatively high, which means the acidity of perspiration is low. Its reactions considered from the acid point of view are those of an extremely weak acid. This is important from the point of view of the textile chemist in regard to the resistance of dyes to perspiration.

It may be of general interest to know how a dyeing withstands steeping in a 10 per cent solution of lactic, hydrochloric or acetic acid; but so far as a comparative test for perspiration is concerned, it's about like putting the goods in the furnace fire to see if they withstand sunlight.

Before committing ourselves to specific problems let us see what in general is known about perspiration.

In the first place, in regard to quantity. While this varies in wide limits according to temperature, humidity, etc., the sensible perspiration, so-called, varies very markedly—and has been entirely absent the last few days—while the insensible perspiration is fairly constant in amount. It averages about one-sixth, 17 per cent of the moisture loss of the human body—about one-third as much as passes away as urine. The perspiration is further relatively much more dilute; whereas urine has total solids of 3 to 5 per cent, perspiration has about one-third of this, or rather less—i. e., about 0.8 to 1.5 per cent.

Analyses of perspiration are remarkably scanty throughout the literature—e. g., there is no authoritative statement as to whether the composition of perspiration is the same whether it is profuse or insensible. Rather the consensus of opinion seems to be that the profuse perspiration on a summer's day is more dilute. In other words, that there is about so much total solid eliminated anyway, and this is more or less diluted according to the needs of the human economy for a cooling system. It is the general opinion of physiological chemists to-day that the principal function of perspiration is that of cooling, with the elimination of nitrogenous constituents as a secondary and relatively unimportant part. This theory is in vogue particularly due to observations in the war hospitals. You know, until very recently if a person were scalded or burned, even if very superficially over so much of an area that one-third of the skin was put temporarily out of commission so far as perspiration was concerned, the case invariably resulted fatally. It used to be said that the patient died of Bright's disease, due to the strain of eliminating the increased amount of total solids usually taken care of by the skin. It now seems that it is not the normal secretions of the skin that damage the kidneys, but the decomposition products of the scorched skin; if a fair portion of the damaged skin is promptly removed and the surface protected with wax, that very much more than a third of the surface of the body may be out of commission and yet the patient recovers.

You in dyehouses where someone is always getting scalded may just as well bear this in mind: that a scald is serious in proportion to the surface burned rather than intensity of the burn, but that if sent to the very best hospital there is a much greater chance of recovery than a few years ago. This experimental proof of the unimportance of the skin for removal of solids rather knocks in the head the story of Cosimo de' Medici's Gilded Boy. You know, he covered a boy with gold leaf for a statue in one of his carnivals, and the boy promptly died because the skin could not breathe. Most likely the gold was debased and the boy died from lead poisoning. However, it was a good story while it lasted, and probably saved lots of lives by preventing foolish experiments.

To come back, the perspiration, normally, then, will be a minimum of about 400 c.c. per day, and this will contain 3½ to 6 grams of total solids, of which a little more than one-half is common salt. Other inorganic constituents, phosphates, sulphates and chlorides of magnesium, calcium and potassium make up about a tenth more, while about three-tenths more comprises the nitrogenous constituents, mostly urea. The remaining one-tenth includes the organic acids present, and presumably lactic; possibly some acetic.

When one considers the extremely small quantity of solid constituents in perspiration, it is perhaps not surprising that more accurate analyses are not available.

It may here be mentioned that perspiration is always contaminated with a little of the oily secretion of the skin. This oily secretion is called sebum; it occurs more abundantly on parts of the body where there is hair, and is distinct from true perspiration in composition. It is analogous to wool grease.

Seeing thus what really is in perspiration, to what are its chemical activities due? The organic acids

present, if any, are in very small quantity, and so buffered that their intensity is very low—practically negligible. Congo Red, Congo Corinth, perhaps Benzo Purpurine, would be affected by the acidity, but no color less sensitive. For one thing, the solids of perspiration, the residue from its saline constituents, are hygroscopic. This is what spots silk linings and hat bands; they are water-spotted and do not dry out. Then the urea constituent is subject to bacterial decomposition with the formation of ammonia and ammonia carbonate. These act as alkalis—rather strong alkalis, in fact—in the moisture held by the hygroscopic residue of the perspiration; and when woolens are perspiration-stained and discolored, it will be found, I believe, in practically every case to be an alkaline staining or alteration of the color due to alkalinity. The time factor must be considered. It takes time for enough urea to be deposited to amount to anything, and then it further takes time for it to undergo bacterial decomposition. In fact, it may never take place; and this explains why damage claims from sweat staining are variable and erratic, also why putting a test piece of cloth around a workman's head or under his arms may not give reliable reuslts.

It should be relatively easy to determine tests which will correspond to actual perspiration, which, I believe you will agree with me, none of the tests now commonly in use actually do.

At the conclusion of this paper the Chairman immediately introduced Mr. Wingate in order to allow any members who were obliged to leave early opportunity to hear the paper.

Mr. Wingate's paper follows:

PACKAGE DYEING

By W. H. Wingate

More interest has been shown in package dyeing during the past few years than ever before. This is due to the many advantages gained in dyeing by this method. There are different methods of dyeing in the package form, but as my experience in this line has been entirely with the Franklin System, the description which follows is based on this process.

The yarn is wound on a spiral spring which is covered with a knitted stocking. This stocking is used to prevent the yarn from falling through the openings, also it keeps the yarn away from direct contact with the spring. The springs are usually three or six inches long, although for some work there may be variations. Dyeings have been made on nine-inch springs for very coarse yarn. The most commonly used springs are iron or brass, the iron being used for sulphur shades while the brass spring is used for other methods.

The finer yarns up to about 40/1 are wound on the three-inch spring and usually contain about eight ounces. The six-inch springs are used for the larger sizes of yarn and a package will contain about a pound of yarn. Packages holding a pound and a half have been dyed very successfully. It is a good idea to have the packages of about the same diameter so that the flow of dye solution will be the same through each. Large and small packages have been dyed together and uniform dyeings made.

There are three kinds of package dyeing machines, iron, bronze, and wood, with brass fittings. These machines are of various sizes, ranging from the one pound sample machine up to the thousand-package machine which will dye from 1,000 to 1,500 pounds of yarn.

The large machine contains a hundred spindles—each spindle will hold ten of the six-inch packages or twenty of the three-inch. The number of spindles and the packages they hold vary with the different sizes.

The yarn is packed into the machine on a perforated spindle and when the spindles are full the top plate is pressed down into place. This forms an unbroken column of yarn through which the dye liquor must pass. The packages should be pressed down hard so that the resistance will be the same throughout the column. If there should be soft or hard packages in the lot this tends to make them all of the same density.

If there are not enough packages to fill all of the spindles in the machine, the empty spindles must be removed and a plug put in or the spindle may be covered over with a pipe. In no case allow a spindle to remain open or partly filled with yarn. This will cause uneven dyeing as the dye solution will flow more through these openings than through the yarn.

When the machine is properly filled the cover is fastened down and the dyeing operation started. In most cases the yarn is boiled out, but in some dyeings, as sulphur black and dark shades, this may not be necessary. When you consider that some cotton dyers have to boil out the yarn all night in a kier, then take it out and dye next day, this method means quite a saving to them.

The well dissolved dye is strained into the expansion tank. It is better to stop the machine while adding the dye solution and have the valve on the outside. The machine is then started with the flow from the outside to the inside. This means that the dye liquor is pumped up through an opening in the center of the machine, flows through the package into the perforated spindle and back to the pump. After flowing for two or three minutes in this direction the flow is reversed by shifting the valve. The dye liquor now flows in the opposite direction, going from the inside of the package to the outside.

There is no set time when the valve should be shifted, but it is good policy to shift often during the first ten

minutes. We have found that a shift of six and eight after the dyeing has been going for a short period works very well. Allow the longer period to be from the outside to the inside of the package.

There is a pipe in the top of the machine where the liquor flows over into the expansion tank. While this pipe is not necessary for the actual dyeing, it allows air to leave the machine when filling, also for it to enter when draining. By watching the flow of liquor from this pipe you can follow the condition of your dye bath. When dyeing vats you can see the reduction of your bath, in other methods the exhaustion, etc.

A recent improvement is the taking of samples during the dyeing operation. This is accomplished by having a small outlet with a quick-opening cover in the top of the machine. Small skeins are tied around the top package under this opening and a string tied to the skein. This string extends up through the small cover. When a sample is required the machine is stopped, the sample cover opened, and the skein of yarn pulled out by the string. By this arrangement you are able to match your shades as in any other method.

Additions of dye can be made as required. In some cases the bath is cooled down—while in others they are made at the boil. It all depends on the shade and dyestuff used.

You are able to dye by all of the different methods of dyeing. The dye bath is very short, being in the proportion of one pound of yarn to a gallon or about eight pounds of water. This means a saving in dye, chemicals, water, steam and, of course, steam means coal.

It is as easy to dye vat shades in the machine as direct colors. The amount of caustic and hydrosulphite used being very important, in all cases that I know of it always has been a great deal less than when dyeing by the open tub method. The dyes are reduced before entering the machine and are then strained through cloth into the expansion tank. They are run in the regular manner, and a large percentage of the dye is taken up during the first five to ten minutes. The dyeing is run about one hour, the solution is run away, the machine alloyed to drain for a few moments and an oxidizing agent added in the first rinse. Perborate of soda has given very good results. Another way to oxidize is to nearly neutralize the caustic remaining in the package with acid in the first rinse and then add an oxidizing agent as peroxide of soda or perborate in a fresh bath. This latter method works out very well where a large percentage of caustic has been used. The shade is finished with a boiling soap bath, and rinsed.

It is interesting to mention that basic shades are dyed successfully in an iron machine. The amount of tannin used being very important, as the dye bath is very short it is necessary to reduce the tannin. Heavy shades require about 2½ per cent tannic acid, while with light shades 1 to 2 per cent has been found sufficient. The tannin is applied in the usual manner and the operation is the same as for any basic dyeing.

Direct and sulphur work are dyed in the regular way. In most all cases it will be necessary to cut down the formula you have used when dyeing by the methods requiring a larger volume of liquor. This usually amounts to from 10 to 25 per cent and recently we had a case where about 50 per cent of the dye was saved.

Developed shades are dyed in the usual way. When diazotizing it is better to reduce the amount of chemicals used, the developing bath being made the same. When dyeing by this method there is no danger of light.

During the past few months we have been doing bleaching in one of the iron machines. Previously this machine was used for all kinds of dyeing, but after boiling out well we replaced the iron spindles with brass ones and have obtained very good results.

The bleach was made in the following way:

The yarn was well boiled out with caustic and soda ash—or any of the other various boiling-out preparations will answer. We have found two boils very efficient—running the first one about one to one and one-half hours and the second two to three hours. The yarn was then washed off well, and given a chemic bleach for one and one-half to two hours. After the chemic the bleach was finished in the regular way—a rinse wash and a boiling soap bath. The bleach can be blued if required.

The advantage of this method is that the yarn is not handled from the time it enters the machine until it is taken out for dyeing.

Bleaching with peroxide of soda has been done in wooden machines.

Worsted yarn is dyed in the package or on the jack-spool. The machines are operated the same as when dyeing cotton yarn. The method of procedure is the same as in any worsted dyeing operation. When dyeing acid or chrome colors suitable dyes must be selected. A large percentage of the fancy worsted mills are equipped with the Franklin Process method of dyeing.

After the dyeing the yarn is washed off in the machine. If any aftertreatment is necessary it is done at this time. It is then hydro-extracted and dried by placing in trays and leaving in the dryer for about ten hours or overnight. The packages are then sent directly to the warping creel. This eliminates the backwinding of skeins, which in most cases causes considerable waste.

We have found the one pound sample dyeing machine of great assistance in our laboratory. We are able to determine how new dyestuffs will work in the machine, also to match up shades and work out new combinations of colors from time to time. As you are working under the same conditions as in the larger machines, a formula

obtained in the one pound machine can be used in the same proportion for any size lot and a like result obtained.

In closing I would like to mention a few of the advantages of package dyeing:

1. The condition of your dyehouse—dry floors, no steam, no odors.

2. Yarn is in compact form, requiring less floor space.

3. Labor cost is very low—one man can run two or three machines.

4. Requires less floor space than any other system.

5. There is a saving in dyes and chemicals, also water, steam, and coal.

6. Ability to duplicate shades with standard formula.

7. Fine yarns dye as well as coarse. No broken ends to cause trouble.

8. Penetration is perfect—the yarn is dyed throughout, as the dye must go through the yarn—the inside being as heavy as the outside.

While these advantages will mean a great saving in the average dyehouse during the year, still greater savings will be noted in the operations after dyeing.

Discussion of "Perspiration"

The Chairman opened the discussion of the subject "Perspiration" at the close of Mr. Wingate's paper. Owing to the widespread trouble caused by the action of perspiration, he thought many dyers would have experiences to recall which would be of mutual interest and help. In his own opinion the chief difficulty was the salt, and he illustrated by mentioning the peculiar behavior of Alizarine Blue SAP, particularly when used in combinations.

When spotted with salt solution and dried, the dye shows a different color. If the salt is subsequently removed the effect of discoloration disappears. In some other illustrations of the peculiar effect of perspiration the chief action appeared to be one of simple bleeding. The Chairman also called attention to the Government lactic and citric acid test as in no way imitating the action of perspiration. Some acid dyes which stand this Government test often fall down in actual use through the influence of perspiration. He believes time permitting the accumulation of the solids of perspiration brings about the stains. As a test for determining fastness to perspiration he uses 10 per cent salt solution, spotting goods and evaporating in cup-shaped container to induce capillarity. The addition of acid to this solution, in his opinion, does no good, and is liable to be misleading by tending to prevent some acid and cotton colors from running. Alkali makes the test more severe, but he doubts the wisdom of its addition, as perspiration is ordinarily neutral. As a sure precaution against perspiration troubles he suggests the use of good Alizarine chrome colors, although they are harder to dye level on piece goods and require a longer time in application.

Mr. Scott expressed interest in the thought of urea decomposing into ammonium carbonate, and inquired if enough carbonate would be formed to give an alkaline reaction and if such a change were characteristic or exceptional.

Mr. Claflin thought it was very likely a normal change under usual bacterial conditions, and that sometimes enough ammonia might be produced to give an alkaline reaction.

Mr. Scott suggested the use of salt solution made slightly alkaline with ammonia; perhaps if the color stood that it would resist the action of perspiration.

The speaker had studied the effects of ammonium bicarbonate, ammonia gas and aqueous ammonia, and had found it possible to move the dye in stain effects. Very likely these were too strong for ordinary testing.

Mr. Moran believed the change of urea giving carbonate explained the moving of color in the dyed fiber better than acid and salt.

Mr. Claflin explained the action of salt as helping to attract moisture, and not as entering into combination with the dye. The amount of salt in perspiration is very low.

Mr. Moran wondered if the difficulties occurring in the South might not be increased by a bacterial action on the solids of perspiration.

Mr. Christison expressed the belief that it was not always safe to infer that the fastness of a dye as tested in a straight dyeing would be the same as when dyed in compound shades. He liked to group the causes of stains as:

1. Ordinary bleeding stains, perhaps due to the development of ammonia.

2. Stains not due to bleeding or ammonia, but taking place on slightly acid fabrics.

The reaction of perspiration might be either acid or alkaline, depending on the presence and activities of special types of bacteria.

Mr. Durfee suggested that there may not be much difference in kind of action between urine and perspiration, the former being the more concentrated. He mentioned as an illustration a Logwood Black broadcloth suiting which had been affected by bodily fluids rich in urea and there was a similarity in kind of action visible. The reaction was perhaps acidic. The reaction of these fluids may be made acid or alkaline by bacterial activity.

Mr. Hovey mentioned the influence of bacteria in producing lactic acids.

Mr. Moorhouse spoke of strong lactic acids as

changing chrome colors probably because of decomposition of the lake.

The Chairman spoke of a slight reducing action of perspiration.

Mr. Coan recalled samples of urine having sufficient reducing power to reduce indigo in three hours.

Mr. Christison read a letter from H. A. Mereness containing a formula for a testing solution used in silk. The solution consisted of water, 100; sodium chloride, 7; potassium sulphate, 1; sodium ammonium phosphate, 1.5; phosphoric acid, a trace. The samples to be tested were wrapped in felt and waterproof paper, and placed around a beaker of water heated to 100 deg. Fahr. and left for an hour. The results of tests made with this solution checked well with those obtained by armpit samples.

Mr. Moorhouse suggested it might be well to keep it wet thus for an hour and then allow to evaporate to dryness.

Mr. Spurr advanced the idea of modifying this procedure by using two felts, putting the cloth, spotted with Mr. Claflin's test solution, between the felts and applying pressure at the center. The heat would tend to develop alkalinity and the pressure at the center would help to produce capillarity, bringing the liquids up into the 2 or 3 inches of free edges of the cloth.

The Chairman, after calling for other methods used in testing and receiving no response, then opened the discussion on "Package Dyeing."

Discussion of "Package Dyeing"

In opening the discussion relative to package dyeing the chairman recalled the unusual appearance for a dyehouse which he found when visiting the Franklin Process Company dyehouse, where everything was dry and free from steam. He thought if the principle employed could also be adapted to piece goods, much trouble for dyers might be eliminated.

Mr. Biery asked how a stock sulphur dye solution would be handled in the Franklin machine.

Mr. Wingate replied that special valve and pump connections would be made with a storage tank located either above or below the machine. Extra dye would be added in the mixing tank as usual.

Mr. Biery inquired how much dye would be added each time of use. In standing baths in open machines there is required 15 per cent to 16 per cent of dye to begin and 8 per cent for each successive use, for a black.

Mr. Wingate believed 12 to 13 per cent of dye would be needed to start the bath and subsequent additions of 6 to 7 per cent each time of use would maintain the shade.

Mr. Coan asked about the addition of tartar emetic in mordanting for basic colors, to which Mr. Wingate replied that the addition of tartar emetic should be made in the same manner as any other method.

Mr. Moran said no provision for blowing air to oxidize was made, and asked if the oxidation by peroxide or perborate was considered a cheaper method.

Mr. Wingate said the expense of installation and upkeep of a blowing system would be much more than the cost of the chemicals.

The question of drying the yarn was raised, to which the speaker answered that the material was hydro-extracted and then placed on trays in a dryer. Each lot of material has a given dry weight before dyeing. After drying the lot, ten to fifteen packages are checked to see if they are in proportion to original weights; if so, the batch is considered correct.

Mr. Biery inquired about the dyeing of motes.

Mr. Wingate had not noticed any trouble.

Prof. Olney asked about the disposition of the stockings used to cover the springs placed in the packages.

The speaker said these could be stored for repeat lots, or, by starting with light shades, could be used in successively heavier dyeings. All colored stockings can be used for black.

Mr. Biery wanted to know if Sulphur Blues were dulled in dyeing with the machine.

Mr. Wingate said they might be, but often the dullness would be removed in subsequent operations, or they might be brightened by soaping. If soaping were not permissible then the dullness would have to go or else a dye selected which would not be affected.

It was asked if small additions of dye in topping light shades would give uneven results.

The answer was negative. An instance of a light gray was cited as illustration, where small additions of dye were made, and the resulting packages were even throughout.

Mr. Putnam inquired if piece dyeing on spools had been attempted.

Mr. Wingate said the company is doing work on the problem, but is not ready to announce anything along that line as yet.

Mr. Christison mentioned a cause for the supposed dullness, which he had heard at the New York meeting, where it was explained as being due to white fibers left in the inside of the yarn through poor penetration. If penetration was good there was no "dulling."

Prof. Olney moved for a rising vote of thanks to both speakers, which was voted and given.

Mr. Winthrop Durfee moved for an adjournment to an informal meeting at about eight o'clock.

A. K. JOHNSON, Secretary.

SCIENTIFIC WASHING

(*Continued from page* 208.)

of classifications. It varies in different localities in accordance with a number of factors, such as—

(a) The density of population.
(b) Industrial influence.
(c) Climatic conditions (winds, etc.).
(d) The class of people from which the laundryman's trade is derived.
(e) Occupations of the customers.

Influence of Textile Fiber or Dirt

Unfortunately, textile fibers have a certain capacity or affinity for holding some forms of dirt very firmly. This is chiefly because they are absorbent, like most fibrous materials, and practically all forms of dirt which have a low surface tension (oils, greases, etc.) are absorbed, much as a blotter absorbs ink. In addition, many types of dirt adhere to the *surface* of the fiber, and the problem becomes one of getting the dirt *out* as well as *off* of the fiber.

The practice of adding a little starch to goods whenever possible is a good one because it coats the fibers with a thin film of jellylike material which the fibers cannot soak up nor absorb, and which in itself is impervious to oils and greases. When a garment so treated is returned to the laundry, the dirt is on the *surface,* not *absorbed,* and as the starch is loosened in the washing process the dirt floats off with it.

The use of starch, of course, reduces the absorbency, and should not be practised on such goods as towels and kitchen rags, where one of the important requirements is absorbency, but its moderate application to practically all other cotton and linen materials may be employed to advantage. By using starch judiciously under the conditions described, we do not depart from the idea of producing a "clean bright garment," for we add a clean bright substance to the cleansed garment, and the addition is such that a better appearance is produced and maintained during the period of wear—all of which reacts in the launderer's favor.

Classifying Dirt

It is safe to say that the launderer never is confronted with a pure dirt of one type only, a mixture of several of the different types being the general rule.

A classification of the various forms of dirt would include three general divisions:

1. Substances which dissolve in water.
2. Substances which do not dissolve in water.
3. Stains.

Each of these three divisions can be subdivided into two groups, one of which is subject to chemical reaction under wash-wheel conditions, and one of which is not chemically reactive. In other words, the second group is inert or unresponsive to chemicals such as we could use in the washroom. Here let us notice again that it is a mistaken notion for launderers to say to their trade, "We use no chemicals." We *do* use chemicals, and were it not for chemicals no one—not even the housewife herself—could restore soiled clothing to a clean condition.

Our family physician restores the bloom of health to our checks by scientifically applied chemicals; we partake three times daily of edible chemicals; and some men appear to be having a terrific time in their eagerness to get liquid chemicals. Why the disclaimers, therefore, on the use of chemicals in the laundry? Wrong chemicals cause harm to the human system just as wrong chemicals injure the laundering system, for we must all recognize that there are certain chemicals which have no place in the washroom. The primary object of this series of scientific washroom discussions is to broadcast a general knowledge of the practical chemistry involved in washing, so that mistakes may be fewer and the removal of dirt be done more artfully.

Our classification of dirt now stands like this:

1. Substances Soluble in Water. (Largely removed in the break.)
   a. *Chemically Reactive.* (Under wash-wheel conditions.)
      a1. Organic and inorganic acids derived from soil and foods.
      a2. Alkaline substances derived chiefly from soil.
      a3. Blood pigments.
   b. *Chemically Inert.*
      b1. Starch (as found on the goods).
      b2. Sugar (candy, syrups, etc.).
2. *Substances Insoluble in Water.* (Removed by the suds operation.)
   a. *Chemically Reactive* (saponifiable, for instance).
      a1. Fatty acids.
      a2. Resinous substances.
      a3. Some albuminous substances (milk, casein, etc.).
      a4. Paint (vehicle or liquid used to suspend the pigment).
   b. *Chemically Inert* (emulsifiable).
      b1. Soot (lampblack).
      b2. Mineral oils.
      b3. Vegetable and animal fats (free from fatty acids).
      b4. Earthy matter (sand, etc.).
      b5. Paint (pigment).
3. *Stains.* (Removed by suds operations, bleach, sour, or special stain removers.)

Under this classification we have many substances

which are soluble in water at their origin, fruit juices for instance, but which are absorbed so firmly by the textile fibers that they behave virtually as well-mordanted (fixed) dyes.

Many stains also arise from materials suspended in the water (such as iron oxide, more commonly called rust) which adhere strongly to the textile fibers. In most cases these stains are not removed by the ordinary washing process, especially if the stains are old ones. Specific treatment is necessary.

Among the common stains found are the following: Road tar and oil, iodine, ink (several types), argyrol (silver), grass, egg, dyes (food and textile), perspiration, tobacco, tea, blood, chocolate, grease and oil, iron (rust), soot (lampblack), paint, mildew, stove and shoe polish, coffee, berry (several types).

In order to intelligently remove various stains, the laundryman must equip himself with a knowledge of the nature of the stain and the kind of fabric involved, the effect of the chemicals upon the stain and fabric; and if the goods are colored the effect of the chemicals upon the color must be determined by trial upon some unimportant section of the goods. In all cases of yellow stains, especially when of a general character throughout the garment, there is in all probability iron present, or a conversion of vegetable fiber to cellulose.

So the launderer's problem of addition and subtraction is a rather complicated one, after all.

Returning to the original classification of dirt, we will consider the chemistry and physics involved. Refer to the chart shown above.

Substances Soluble in Water

In the first classification it is obvious that this form of dirt should offer least resistance to removal. Some examples may be more soluble in cold or lukewarm water than in hot water, hence the cold or lukewarm break. Some of these substances are more soluble in an alkaline water. The use of a small amount of a controlled alkali in the break is therefore desirable, particularly if the dirt substance is more soluble at low temperatures.

Substances Insoluble in Water

With the second class, we encounter greater resistance and here the real science of washing must be applied.

Members of the "chemically reactive" group may usually be converted into substances which *are* soluble in water, but in this form are removed in true solution like the simple substances described above. Fatty acids and resins are converted into soluble soaps by the use of the proper alkaline detergent and thus made to serve a useful purpose in loosening other dirt, wetting out, penetrating, and expelling air from the dry goods. Albuminous substances, though insoluble in water, form a soluble compound with alkali. Paints consist of an insoluble (chemically inert) pigment, suspended in a vehicle of linseed oil, varnish gums, etc. The vehicle portion, when properly washed, can be eliminated in a dissolved state, leaving the pigment to be removed physically by emulsification or suspension as colloidal particles. Under certain conditions, a portion of the vehicle may also be emulsified.

The "chemically inert" group must be removed solely by physical action. The low surface tension of a soap solution, reinforced by a properly selected alkaline aid, wets the surface of these substances, and by the influence of colloidal activity and agitation they are broken up into very small particles and globules. Colloidal influence is again called into play to keep these particles in suspension. The complete data on colloidal action as found in discussion No. 1 on soaps will be found interesting here. The finer the particles and the more stable the suspension, the more effective the cleansing will be.

As this class of dirt constitutes the largest portion of the general run of dirt, it is very important that the cleansing agents be selected with a view to securing the utmost in *suspending* qualities. From the scientific and practical viewpoints, the patented detergent Escolite (Soapalite is also recommended) has proved to be excellently fitted, not only for this difficult branch of cleansing but for all other forms as well. It is important that it be used as prescribed, and when so used it will prove to be the mist efficient, safe, thorough and reliable reinforcement of fat soap. Its composition has a distinct relation or bearing upon every form of cleansing involved in washroom practice. It is designed to *eliminate the dirt* and very largely restrict the use of bleach and blue.

Treatment of individual stains is really too extensive a subject to be considered in detail in this paper. We would, however, refer our readers to the suggestions published by the L. N. A., and especially to Farmers' Bulletin No. 861, U. S. Department of Agriculture, which may be obtained for mailing costs from the Division of Publications, U. S. Department of Agriculture. This publication covers the subject very broadly and will prove valuable to every launderer.

Wherever the nature of a stain is such that it may be removed in the washing process, without the use of specific solvents, etc., Escolite will go far toward producing the desired result. In some cases (paints, etc.) Escolite will accomplish things which are beyond the scope of other alkalies.

A waist sent to the writer's company by a launderer who had been unable to remove a yellow color from the yoke proved to be knitted with a yarn of cotton and silk composition. The usual process involving a temperature of from 140 to 180 deg. Fahr. followed by bleach, sour, and blue, will change the very character of silk fiber, resulting in its destruction or at least a change to yellow in color. There is no known method of restoring the color of the altered fiber, although a rinse in citric acid and sun exposure will sometimes help.

Most of the embroidery and knitted cotton on the market at present is a silk and cotton union. A wise precaution would therefore be to wash knitted and embroidered work as one would wash silk.

Dyes Imported for Consumption Through the Port of New York During January

Compiled by the Chemical Division of the Bureau of Foreign and Domestic Commerce, in Colaboration with the Chemical Section, U. S.

KEY TO ABBREVIATIONS FOR FOREIGN MANUFACTURERS

1—The Six Leading German Companies

A—Actien-Gesellschaft fur Anilin-Fabrikation, Berlin. Founded 1873. Branches in France and Russia.
B—Badische Anilin-und Soda-Fabrik, Ludwigshafen on the Rhine. Founded 1865. Branches in France and Russia.
By—Farbenfabriken vorm. Friedr. Bayer & Co., Leverkusen on the Rhine. Founded 1862. Branches in France and Russia.
C—Leopold Cassella & Co., Frankfort on the Main. Founded 1870. Branches in France and Russia.
K—Kalle & Co., A. G., Biebrich on the Rhine. Founded 1870. Branches in Russia.
M—Farbwerke vorm. Meister Lucius & Bruning, Hochst on the Main. Founded 1862. Branches in France and Russia.

2—The Seven Smaller German Companies

BK—Leipziger Anilinfabrik Beyer & Kegel. Furstenberg near Leipzig. Founded 1882.
GG—Chemikalienwerk Greisheim G.m.b.H., Griesheim on the Main. Founded 1881.
CJ—Carl Jager G.m.b.H., Anilinfarbenfabrik, Dusseldorf. Founded 1823.
GrE—Chemische Fabrik Griesheim-Electron, Offenbach on the Main. Founded 1842.
L—Farbwerk Muhlheim vorm. A. Leonhardt & Co., Muhlheim on the Main. Founded 1879. Branch in France.
tM—Chemische Fabriken vorm. Weiler ter Meer, Uerdingen on the Rhine. Founded 1877.
WD—Wulfing, Dahl & Co., A. G. Barmen. Founded 1842.

3—Dutch, Belgian and French Companies

FA—Farbwerk Ammersfoort, Ammersfoort, Netherlands. Founded 1888.
NF—Niederlandische Farbe-und Chemikalienfabrik Delft, Netherlands (Delft). Founded 1897. Branch in Russia.
LG—Lazard Godchaux, of Brussels. (These products are probably compounded largely from the dyes made by A. Wiescher & Co., of Haeren, Belgium.)
P—Societe Anonyme des Matieres colorantes et produits chimiques St. Denis (formerly A. Poirrier), St. Denis, near Paris, France. Founded 1830.

4—Swiss Companies (all at Basel)

DH—Farbwerke vorm. L. Durand, Huguenin & Co. Founded 1871. Branches in Germany and France.
G—Anilinfarben-und Extract-Fabriken vorm. Joh. Rud. Geigy. Founded 1764. Branches in France, Germany and Russia.
I—Gesellschaft fur chemische Industrie. Founded 1885. Branch in France.
S—Chemische Fabrik vorm. Sandoz & Co. Founded 1887.

5—English Companies

ClCo—The Clayton Aniline Co., Ltd., Clayton, near Manchester. Founded 1876.
CR—Clauss & Co. (formerly Clauss & Ree), Clayton, near Manchester. Founded 1890.
CV—Colne Vale Chemical Co., Milnsbridge, near Huddersfield.
RHS—Read Holliday & Sons, Ltd., Huddersfield. Founded 1830. (Purchases by British Dyes, Ltd.)
BD—British Dyes, Ltd. Founded 1915.
Lev—Levinstein, Ltd., Crumpsall Vale, near Manchester. Founded 1864.
Q—Importations of unknown source, through dealers in colors.

Schultz No.	Name of Dye and Manufacturer	Quantity (pounds)
19	Fast Light Yellow 2G—(By)	99
28	Hansa Yellow G Powder—(M)	900
34	Chrysoidine RL Base—(B)	10
93	Pigment Purple A Paste—(M)	25
159	Acid Alizarine Black R—(M)	11
164	Diamond Blue R—(By)	0.55
240	Janus Red B—(M)	100
293	Milling Red G—(C)	100
333	Minaxo Black BHN Extra—(B)	5
343	Diamine Fast Red 8BL—(C)	200
348	Diphenyl Brown BBNC—(G)	331
358	Chloramine Red 8BS—(By)	300
373	Congo Orange R—(By)	50
424	Chloramine Sky Blue FF Conc.—(S)	1,101
456	Benzo Fast Blue 2GL—(By)	1,683
	Benzo Fast Blue 4GL—(By)	
493	Auramine N Conc.—(S)	3,503
497	Victoria Green Base—(B)	5
500	Setopaline Conc. 707—(G)	220
503	Erio Viridine B Supra 561—(G)	1,764
515	Methyl Violet NFB—(B)	60
523	Fast Green Extra Bluish—(By)	220
527	Acid Violet 6BNOO—(B)	860
530	Acid Violet 3BNO—(B)	15
543	Patent Marine Blue LE—(M)	441
545	Patent Blue A—(M)	3,200
546	Cyanole	2,500
	Cyanole FF—(C)	
	Cyanole Extra—(C)	
554	Chrome Azurol SXT1046—(G)	441
559	Victoria Blue B Base—(B)	10
571	Rhodamine 6G	3,801
	Rhodamine 6G Extra—(S)	
	Rhodamine 6G Extra—(M)	
	Rhodamine 6GDN—(B)	
	Rhodamine 6GDN Extra—(B)	
573	Rhodamine B Extra—(S)	4,409
603	Acridine Orange DHE—(DH)	882
608	Patent Phosphine (Euchrysine)	1,125
	Patent Phosphine GRNTN—(B)	
	Patent Phosphine RRQX—(B)	
613	Quinoline Yellow N—(Q)	220
618	Thioflavine T—(C)	500
622	Brilliant Delphine Blue B—(S)	899
649	Meldola Blue 3R Paste—(S)	300
660	Methylene Green	487
	Methylene Green B Conc.—(By)	
	Methylene Green Extra Yellow—(M)	
672	Azo Carmine GX—(B)	100
681	Malta Gray B—(P)	439
700	Nigrosine T—(B)	1,000
746	Katigen Green 4B—(By)	0.55
754	Kurgan Violet 3RX—(B)	500
	(Kryogen Violet 3RX)	
760 or 761	Indanthrene Gold Orange—(Q)	882
761	Indanthrene Golden Orange R (single strength)	9,154

Schultz No.	Name of Dye and Manufacturer	Quantity (pounds)
	Indanthrene Golden Orange RRT Paste—(B)	
	Indanthrene Golden Orange RRT Paste Fine—(B)	
	Indanthrene Golden Orange RRT Powder—(B)	
768	Indanthrene Violet B	993
	Indanthrene Black—(B)	
	Indanthrene Violet B Paste—(B)	
778	Alizarine VI Extra Pure 20%—(B)	8,380
780	Alizarine Red S Powder—(B)	500
782	Anthracene Brown R Powder—(By)	25
784	Alizarine LX 20%—(B)	1,257
816	Algol Red 5G Powder (single strength)—(By)	317
818	Algol Pink R Paste—(By)	1,596
819	Algol Red FF Extra Paste—(By)	1,001
820	Algol Brilliant Violet RK Paste—(By)	15
	Anthra Bordeaux R Paste—(B)	1,754
828	(Indanthrene Bordeaux R Paste)	
836	Helindone Brown 3GN Paste—(M)	110
838	Indanthrene Blue RSP (single strength)—(B)	15,000
840	Indanthrene Blue 3G—(B)	6,211
841	Indanthrene Blue GGSP (single strength)—(B)	600
843	Indanthrene Blue GCD (single strength—(B)	18,606
849	Indanthrene Yellow (single strength)	16,400
	Indanthrene Yellow G Double Paste—(B)	
	Indanthrene Yellow GP Powder—(B)	
852	Alizarine Blue JR Powder—(By)	12
855	Alizarine Sky Blue B—(By)	110
856	Alizarine Rubinol R—(By)	330
858	Alizarin Saphirol	1,661
	Alizarine Saphirol—(By)	
	Alizarine Saphirol SE—(By)	
	Alizarine Saphirol WSA—(By)	
	Alizarine Blue SAWSA Pdr.—(By)	
	Helio Fast Blue SL Conc.—(By)	
859	Cyananthrol RXO Powder—(By)	860
862	Alizarine Blue Black (single strength)	6,836
	Alizarine Blue Black B Pdr.—(By)	
	Alizarine Blue Black 3B—(M)	
	Alizarine Blue Black 3BX—(M)	
865	Alizarine Cyanino Green E Pdr—(By)	3,880
869	Algol Brown B (single strength)	1,514
	Algol Brown R Powder—(By)	
883	Indigo MLB/6B (single strength)—(M)	2,095
892	Helindone Green G Powder—(M)	33
899	Ciba Gray G Paste 20%—(I)	882
901	Ciba Violet B Paste 10%—(I)	661
907	Helindone Fast Scarlet G Paste—(M)	50
913	Thio Indigo Orange R Powder—(K)	344
918	Helindone Red 3B (single strength)—(M)	2,168

Unidentified Acid Dyes

Alkali Fast Green—(By)	0.55
Anthra Cyanine Brown RL—(By)	0.55
Anthra Cyanine Green BL—(By)	0.55
Anthra Cyanine Green 3GL—(By)	0.55
Azo Blue B Conc.—(S)	201
Azo Orseille—(C)	200
Cloth Fast Red GR Conc. 200%—(I)	661
Erio Fast Cyanine SE—(G)	772
Minaxo Acid Brown G—(B)	1,000
Polar Maroon VC680—(G)	882
Polar Red G—(G)	2,425
Spruce Brown R (Supramine Brown R)	232
Spruce Brown R—(B)	
Supramine Brown R—(By)	

Unidentified Vat Dyes

Anthra Pink R Extra Paste—(B)	5,000
(Indanthrene Pink R)	
Helindone Black T—(M)	100
Helindone Brown JG Paste—(M)	300
Helindone Gold Orange	3,200
Helindone Gold Orange IG Double Paste—(M)	
Helindone Gold Orange IRRI Paste—(M)	
Helindone Pink	6,720
Helindone Pink B Extra—(M)	
Helindone Pink B Extra Powder—(M)	
Helindone Pink R Extra—(M)	
Helindone Pink R Extra Paste—(M)	
Helindone Violet 2R Paste—(Q)	209
Indanthrene Orange 6RTK Powder—(By)	99
Indanthrene Violet	6,102
Indanthrene Violet BN Pst. (fine)—(B)	
Indanthrene Violet BN Pst. (extra)—(B)	

Unidentified Mordant and Chrome Dyes

Acid Chrome Blue	1.10
Acid Chrome Blue 3G—(By)	
Acid Chrome Blue 3RX—(By)	
Anthrachromate Brown EB—(L)	551
Chrome Violet VM Powder—(M)	10
Chromoxane Brown 5R—(By)	0.55
Eriochrome Black E—(G)	2,866
Eriochrome Flavine—(G)	441
Gallo Violet DF—(By)	0.55
Gallo Viridine G—(By)	0.55
Lanasol Blue B—(I)	882
Omega Chrome Brown PB Conc.—(S)	201

Unidentified Direct Dyes

Benzo Chrome Brown R—(By)	0.28
Benzo Fast Black L—(By)	600

Name of Dye and Manufacturer	Quantity (pounds)
Benzo Fast Orange S—(By)	701
Brilliant Benzo Violet B—(By)	201
Brilliant Sky Blue 2RM—(P)	696
Chloramine Brown 2R Conc.—(S)	500
Diamine Fast Orange ER—(Q)	220
Diamine Orange F—(C)	25
Diazamine Blue BR Conc.—(S)	2,937
Diazo Indigo Blue M—(By)	1.10
Unidentified Sulphur Dyes	
Katigen Chrome Blue 5G—(By)	0.55
Thiogene New Blue	81
Thiogene New Blue 2RL—(M)	
Thiogene New Blue 2RL Ex. Conc.—(M)	
Unidentified Basic Dyes	
Tannoflavine T—(S)	500
Unidentified Color Lake Dyes	
Hansa Green G Powder—(M)	25
Unidentified, Unclassified Dyes	
Black Base BB—(B)	5
Brilliant Sulphon?—(S)	1,001
Danubia Blue BX—(B)	1,000
Fast Brown for Leather—(By)	0.55
Paper Fast Bordeaux B—(By)	441
Stone Fast Yellow	250
Stone Fast Yellow GG Extra Powder—(B)	
Stone Fast Yellow GR Lumps—(B)	
Stone Fast Yellow 5G Lumps—(B)	
Yellow II—(B)	10
Total pounds	179,309
Dollars	185,344

IMPROVED METHOD OF SECTIONING TEXTILES

(*Concluded from page* 204.)

found best to transfer them one at a time from the watch glass to a microscope slide which has been previously cleaned, then smeared with Meyer's Albumin fixative, or ammonium bichromate and glue mixture, and finally wiped off until only an exceedingly thin film of the adhesive remains. The water adhering to the section is then allowed to drain off and the albumin coagulated by holding the slide several inches above the flame of a Bunsen burner for a few seconds or, in case the ammonium bichromate-glue mixture has been used, by exposing the slide to strong light for several minutes. The paraffin may be removed by placing the slide in a Stender jar containing xylol. A few draps of Canada balsam are then added to the section and a thin cover glass applied. Provided the balsam is sufficiently thin it will take but a few minutes to thoroughly cement the cover glass to the slide. No weight other than that of the cover glass itself should be applied. The finished mount is then ready for examination under any of the objectives of the compound microscope. Sections as thin as 2 microns (1/12,500 in.) have been cut by the senior writer from ordinary cotton dress goods. The accompanying illustration taken from a section of dyed cotton dress goods, prepared in the manner described, shows particularly the cotton fibers of the warp in cross section.

Some of the advantages of the herein described follow:

1. It can be applied to a variety of fibers and fabrics.

2. It is comparatively rapid, thus making it applicable to mill conditions in keeping a constant check upon the various processes to which the textiles are submitted.

3. By the combination of the paraffin and freezing methods it is possible to control to a very fine degree the hardness of the paraffin. This becomes of particular importance in the cutting of thin sections.

4. Extremely thin sections may be cut by this method. Sections as thin as two microns have been cut from ordinary cotton dress goods by the senior writer. The thickness of the section becomes of great importance in an examination with the higher powers of the compound microscope and in photomicrography, since sharpness of definition and details of internal structure are often made clearer in extremely thin sections. Moreover, in thin sections the individual fibers are less liable to be disturbed from their proper relative positions during mounting than thick ones.

5. An accurate idea of the character of dye penetration and distribution of sizing, mercerization processes, etc., may often be gained from a study of these extremely thin sections.—Textile World.

SOME DYEHOUSE TROUBLES

The lecturer stated that faults may be roughly divided into two groups: (1) Faults caused by defects in materials or processes employed prior to dyeing, and (2) faults due to preparing or dyeing processes. Stains due to oil or soap were among the commonest and most difficult faults, since they might be caused in combing, spinning, weaving, scouring, and many other processes. Recently the olive oil used in combing had been frequently adulterated with semi-drying oils, and to make detection by analysis less easy the high iodine value of the mixture was reduced to the normal by further adulteration with oils of low iodine value, such as neatsfoot or mineral oil. The analytical figures of tea-seed closely resemble those of pure olive oil. To avoid machinery oil stains the use of a blend of sperm oil and mineral oil was probably the best lubricant.—F. M. Perkin, in a lecture reported in J. Soc. Dyers and Col., 1922, **12,** 299, through Jnl. Textile Institute.

Mussolini Government Appoints Commission to Study Italian Dye Import Tariff

Hope to Establish Free Trade—Foreign Investors Respond to Proffer of Income Tax Exemptions on Italian Corporate and Municipal Securities—Ruhr Invasion Brings Down Value of Lira—Italian Dye Manufacturers Show Profits for Past Fiscal Year

By RAFFAELE SANSONE

Genoa, February 12, 1923.
Special to The Reporter.

THE French invasion of Germany brought down somewhat the value of the lira, although Italy sent only engineers with the expedition. The fall did not, however, go beyond certain limits, and brought the United States dollar from 19.50 lire to 21 lire and the English pound sterling from 88 lire to 98 lire. The French franc was reduced from 1.30 lire to 1.20 lire.

A government commission in Rome was appointed to study the importation tariffs; to consider this question not only as regards the manufacturers, but also as regards the consumers, and with the view of establishing free trade.

It being the desire of the Mussolini Government to encourage foreign investments in Italian enterprises, a decree was issued exempting from income tax, for a certain number of years, the interest on all investments arranged abroad, and of the shares placed abroad by Italian companies, communes, provinces, etc. The arrangement appears to have had a certain effect, and as a result much more interest has been awakened in the commercial enterprises of Italy, many foreign capitalists essaying to invest considerable sums in its industries, railways and hydroelectric plants. Such investments have likewise been materially encouraged through the greater willingness of operatives to work and the increased production possible during 1922 with a lower employment of labor working at lower wages.

The profits made during the past financial year by some of the Italian color producing concerns were very satisfactory, considering the times, and the effects of the competition of the abundance of war reparation products were plainly evident. Thus, for example, the Industria Nazionale Colori di Anilina, of Milan, on a capital of 2,400,000 lire, paid a dividend to its shareholders of 7½ per cent.

Italy imported during the first six months of 1922 about 702 tons of synthetic coloring matters, of which 629 tons came from Germany on account of war reparation, 63 tons from Switzerland, and the rest from other countries. Of the coloring matters imported, 57½ tons were sulphur colors, 508 tons were colors with less than 50 per cent of water, 74 tons were pastes with more than

TABLE I

	January 10 (lire)	January 10 (dollars)	February 10 (lire)	February 10 (dollars)
Naphthol Yellow	49,000—65,000	2,051—3,333	49,000—65,000	1,904—3,095
Auramine	60,000—70,000	3,076—3,589	60,000—70,000	2,857—3,333
Orange II	22,000—25,000	1,128—1,282	20,000—22,000	952—1,047
Nigrosine, water soluble	28,000—35,000	1,435—1,784	28,000—35,000	1,333—1,666
Nigrosine, soluble in alcohol	30,000—38,000	1,538—1,948	30,000—38,000	1,428—1,809
Sulphur Black	6,750— 9,750	346— 500	7,000—11,000	333— 523
Acid Black	30,000—35,000	1,538—1,794	27,000—30,000	1,285—1,428
Direct Black	30,000—36,000	1,538—1,846	27,000—33,000	1,285—1,571
Chrome Black	34,000—38,500	1,743—1,974	31,000—36,000	1,476—1,714
Methylene Blue	75,000—90,000	3,846—4,615	75,000—90,000	3,571—4,285
Direct Blue	24,500—28,000	1,265—1,435	23,000—27,000	1,095—1,285
Sulphur Blue	33,500—38,000	1,717—1,948	30,000—33,000	1,428—1,571
Malachite Green	75,000—90,000	3,846—4,615	75,000—90,000	3,571—4,285
Acid Green	60,000—70,000	3,076—3,584	60,000—70,000	2,857—3,333
Direct Green	41,000—54,500	2,102—2,794	35,000—50,000	1,666—2,380
Bismarck Brown	35,000—42,000	1,794—2,153	32,000—39,000	1,523—1,857
Magenta (Fuchsine) Crystals	70,000—80,000	3,589—4,103	70,000—80,000	3,333—3,809
Eosine	50,000—75,000	2,564—3,846	50,000—75,000	2,380—3,571
Ponceaux	28,500—35,000	1,461—1,794	27,000—32,000	1,285—1,523
Methyl Violet	65,000—80,000	3,333—4,103	65,000—80,000	3,095—3,809

TABLE II

	January 10		February 10	
	(lire)	(dollars)	(lire)	(dollars)
Acetate of alumina	1,600	82	1,600	76
Chrome alum	3,500	179	3,500	166
Bichromate of potash	5,900	302	5,900	280
Ferrous sulphate	500	25	500	23
Copper sulphate	2,280	117	2,200	104
Tartar emetic	12,000	615	12,000	571
Aniline oil	13,500	692	13,500	642
White refined glycerine	8,800	451	8,800	419
Glucose, 45 deg. Be	3,900	200	3,900	185
Hydrogen peroxide	2,100	107	3,100	100
Tannic acid, 60 per cent	20,000	1,025	20,000	952
Tartaric acid, crystals	13,500	692	13,500	642
Acetic acid, 30 per cent	2,200	112	2,200	104
Formic acid	8,500	435	8,500	404
Hydrochloric acid, 20-21 deg. Be	250	12	250	11
Lactic acid, 80 per cent	6,000	307	6,000	285
Alum	900	46	850	40
Ammonia, 22 deg. Be	1,450	74	1,600	76
Bisulphite of soda, 32 deg. Be	380	19	380	18
Chlorate of potash	3,200	164	3,200	152
Chloride of ammonia	4,000	205	3,000	142
Bleaching powder	900	46	900	42
Nitrite of soda	2,950	151	2,950	140
Yellow prussiate of potash	22,000	1,128	20,000	952
Yellow prussiate of soda	15,000	769	15,000	714
Caustic soda, 70-72	2,000	102	1,800	85
Silicate of soda, 140 deg. Tw	1,000	51	1,000	47
Sodium sulphide	2,500	128	2,500	119
Logwood extract	8,000	410	8,000	380
White dextrine	2,950	151	3,000	142
Farina	2,050	105	2,300	109
Kordofan gum	8,000	410	8,000	380
Indigo, 25 per cent	23,000	1,179	22,000	1,047
Beta-naphthol	19,000	974	19,000	904
Industrial castor oil	6,500	333	6,000	285

50 per cent of water, etc. Of the exports made, 12½ tons were sulphur colors, 45 tons were other colors with less than 50 per cent of water, and 1½ tons were colors with more than 50 per cent of water.

The Demand for Coloring Matters

The demand for coloring matters obtained from coal-tar continued good during the elapsed six weeks. In the case of wool colors the products mostly demanded were Acid Blues, Fast Chrome Blacks, Ponceaux, Acid Scarlets, Chrome colors, Acid Oranges, Quinoline Yellow, etc. For silk colors the demand was limited to a few colors. Of the cotton colors were demanded Chrysophenine, the Ericas, Benzorpurpurines, Fast Cotton Scarlets, Direct Violets, Direct Browns, Direct Blues, Direct Greens, Diazo Blacks, etc.

Prices of Coal-Tar Dyes

The quotations of reparation dyes in Table I, per ton in lire and dollars, show the great reductions effected and differences brought about in the dollar and lira prices at the moment of writing, in comparison with the prices prevailing on January 8 (the dyes being delivered in kegs from 25 to 50 kilos).

Mordants, Assistants, Dyehouse Products

Through the regain of foreign exchange and the strong demand of the dye works and print works, the falls in price were not numerous. Some of the lira and dollar quotations are given, per ton at Milan, in Table II.

Private Dyehouse Quotations

Some private quotations for dyestuffs at Genoa were

as follows per kilo, showing how these competed against the war reparation products: Direct Black, 32 to 35 lire; Nigrosine Crystals, 26 to 30 lire; Chrome Black in powder, 35 to 36 lire; Direct Green, 44 to 50 lire; Eosine, 51 to 75 lire; Orange II, 21 to 26 lire; Methylene Blue, 75 to 90 lire; Liquid Fustic Extract, 8 to 8.50 lire; Logwood Extract, 8 to 8.50 lire, and Hematine Crystals, 12 to 13 lire.

Must Attack Foreign Markets, Garvan Tells S. O. C. M. A. at Second Annual Meeting.

Dr. C. H. Herty Again Heads Organization

"PUBLIC OPINION SOUND," HE STATES

Both Speakers Dwell on Co-operation and Education

THAT the occupation of the Ruhr by the French links up closely with the progress of the chemical industry of the United States was one of the points brought out in a speech by the Hon. Francis P. Garvan, president of the Chemical Foundation and former Alien Property Custodian, at the Second Annual Meeting of the Synthetic Organic Chemical Manufacturers Association of the United States, held at the Hotel Pennsylvania on Tuesday, March 8. Mr. Garvan told the member of the Association that the occupation of the Ruhr had its root in the Treaty of Versailles when the report was made to the Conference on Disarmament, in which it was made clear that every chemical factory must be regarded as a potential arsenal.

He brought out the fact that the German factories would have been confiscated then had it not been for the opposition of the representatives of the United States, who held that the best answer to German chemical supremacy was the building up of an American industry equal if not superior to that of the Germans.

He also dwelt on the great progress made by the industry in this country, particularly in medicinals, giving as examples the development of the cure for diabetes, as well as the great progress that has been made in the cheapening and purification of arsphenamine, or salvarsan.

Dr. Charles H. Herty, president of the Association, submitted his annual report, in which he told of the work of the Association during the year. At the close of the morning session it was unanimously voted to make Mr. Garvan an honorary member. A vote of thanks was also tendered C. C. Concannon, chief of the Chemical Division, Department of Commerce, for his splendid work in co-operating with the industry.

Following is a list of officers and directors elected in the afternoon session:

Officers Elected

Board of Governors—President, Charles H. Herty; treasurer, F. P. Summers, Noil Chemical & Color Works, New York City.

Dyestuffs Section—F. E. Signer, vice-president, Butterworth-Judson Corporation, New York City; August Merz, Heller & Merz Company, Newark, N. J.; C. N. Turner, Newport Chemical Works, Passaic, N. J.; F. P. Summers, Noil Chemical & Color Works, New York City; George H. Whaley, John Campbell & Co., New York City.

Crudes and Intermediates Section—F. W. Pickard, vice-president, E. I. du Pont de Nemours & Co., Wilmington, Del.; S. W. Wilder, Merrimac Chemical Company, Boston, Mass.; R. N. Wallach, Grasselli Chemical Company, New York City; William S. Weeks, Calco Chemical Company, Bound Brook, N. J.

Fine Organic and Medicinal Chemicals Section—A. S. Burdick, vice-president, Abbott Laboratories, Chicago, Ill.; Herman Seydel, Seydel Chemical Company, New York City; G. F. Richmond, Antoine Chiris Company, New York City.

Regrets from Brigadier-General Fries

Regrets that they could not be present to address the meeting were received from Brigadier-General Amos A. Fries, chief of the U. S. Army Chemical Warfare Service, whose prior engagement to speak at Camp Benning, Ga., was responsible for his absence, and from John P. Wood, whom another date prevented from being present.

"More Sympathetic Public Understanding," Says Herty

"The constitutional year just ending may well be designated one of the most remarkable periods through which any branch of industry has passed," declared Dr. Herty in his address. "Faced at the outset with a Congressional investigation, avowedly proposed with hostile intent; engaged for months in a struggle for legislation assuredly protective against a vicious foreign competition; shaken for a while to its very roots by an unexpected governmental attack upon the governmentally authorized holding of important patents; bearing throughout this period the brunt of a general industrial depression; surely these have been times to try men's souls. And yet at the close of the year we find the clouds dispersed, our industry enjoying a far larger measure of sympathetic public understanding, constantly increasing cordial relations between producers and consumers, ample contentment with the quality and price of our products and consequent placing of orders which insure prosperous times ahead. Only a sound keel could have weathered such a storm. It is that though which gives confidence for the rest of the journey.

"Into the initial strife and turmoil of the period this association was thrust at the very outset of its organized existence. Its conception lay in the conviction that the vigorous development of all branches of synthetic organic chemistry was necessary if America was to be fully served, and that for all of these branches there were problems in common which, while in no wise restraining individual initiative, could be best solved by common counsel and by joint and equitable distribution of expense.

"In this industry organization and association was particularly needed, for the industry was young and without those traditions which are so helpfully stabilizing in other industrials, even personal acquaintances were to a large extent lacking among many of its members. The fascinating story of the sturdy development of the pioneer cities of our West is being retold in the upbuilding of this industry. Not the least accomplishment of the past year has been the engendering of a broader spirit of community interest and the realization that 'the other fellow' has his good points, and that trials and tribulations are common to all.

Organization No Financial Burden

"That this organized effort within the industry has not been financially burdensome is attested by a comparison of our association expense account for 1922 with the Tariff Commission's figures for sales of intermediates and finished products in 1921. The proportion is only thirteen-hundredths of one per cent, a truly modest figure. In order that we may gain a clearer appreciation of how this investment has been distributed, let me review briefly the outstanding events of the year in which the association has taken part.

The Senate Investigation

"Investigation of our industry by a committee of the U. S. Senate, while originating in quarters inimical to the industry, was welcomed as an ideal opportunity for correcting, once and for all, the misleading and vicious propaganda so industriously circulated. At the very outset this association promptly offered to the committee the fullest co-operation of all of its members, and it is worthy of record here that the one of our members which had been most notably singled out as the target of attack, namely, the Du Pont company, not only offered to the committee every facility for inspection of its books and records, but also authorized the Tariff Commission to freely place at the disposal of the committee confidential information already filed with the commission in connection with its annual census. Throughout the four months during which the committee sat, and with such exemplary patience on the part of its chairman, Senator Shortridge, listened to everything that anyone interested in the subject had to say, your association was continuously represented. The printed testimony constitutes an invaluable permanent record of the development of this industry and, while no formal report was filed with the Senate, such report was not needed in view of the clear-cut statement by the chairman of the committee on the floor of the Senate that not a scintilla of evidence had been produced in support of the charges in the resolution ordering the investigation. This investigation, plainly intended to muddy the waters at a time when the industry would be seeking protective legislation, proved a boomerang and cleared the atmosphere in the minds of Senators, as news of the facts developed by the testimony filtered out from the committee room.

The Government's Patent Suit

"With all signs favorable for the adoption of the report of the Finance Committee by the Senate, a new factor was thrust into the legislative situation by the demand of the President of the United States upon the Alien Property Custodian that he institute suit against the Chemical Foundation, Inc., for the recovery of the seized enemy patents, transferred to that organization by a former President of the United States. As the demand for the suit was accompanied by no statement of subsequent policies to be pursued in case of the successful outcome of the suit, our industry was thrown into utter confusion because of the uncertainty of the status of licensees and of the threat of future legal complications. Thereupon, your board of governors promptly requested an audience with the President, which was with equal promptness courteously granted. This conference enabled us to place clearly before the President the condition of the industry, and our conviction that a gross injustice had been done in instituting this suit. While no immediate results were apparent, nevertheless as time has passed, assurances have been given that in the event of the successful outcome of the suit, licensees will be protected, and it is particularly interesting to note that in the Winslow bill, just enacted by Congress, provision was made to except from the clauses of that bill the return of such patents as are under litigation. The suit of the Government opens next month. The industry awaits unperturbed the outcome of that suit, confident that the acts of the former administration, so thoroughly made public at the time, will be fully sustained.

Results of Educational Work

"Nevertheless, the sensation produced by the ordering of this suit confused the minds of many members of the Senate, as later unhesitatingly stated by a number of members of that body, so that the recommendations of the Finance Committee for the continuation of the embargo

were rejected by a close vote of the Senate, sitting as a Committee of the Whole. Immediately a systematic campaign was inaugurated by your association to make clear to the members of the Senate the disastrous consequences which would ensue should this decision prove final. In this work, truly educational in its character, members of the association freely gave their time and at their own expense systematically canvassed the entire Senate. As a result of this fine work an overwhelming sentiment was developed favoring safeguarding the industry. Subsequently the Bursum amendment was passed placing high rates of duty on all synthetic organic chemicals. The debate on the floor of the Senate in connection with this amendment showed clearly the enthusiastic support of the leaders of that body. Unfortunately, in the last days before the bill was enacted, through lack of understanding of the situation by members of the House, and through the inevitable parleyings of the Conference Committee, the final form of the legislation was completely changed, and when adopted seemed to close the door of hope for further progress of the industry. However, as the details of the act have been carefully studied and the administrative features of the bill have become more thoroughly understood, it would seem that the measure does reflect a sentiment on the part of the Congress that this industry must be preserved to the nation.

Defects in Tariff Law

"As enacted, much is left to administrative regulations. These have now been carefully worked out by the Customs Division of the Treasury Department and, while they are not all that should be expected in connection with an act whose purpose avowedly is to protect and build up American industries, nevertheless, they show a spirit of fairness to all parties concerned—manufacturers, importers and consumers.

"The chief defects of the tariff bill as enacted are the diminution of protection as the price of the respective products increases, discouraging thereby efforts to develop new lines of products which, in the light of the history of the industry over the last forty years, are necessarily high-priced at the outset, and the utter inadequacy of the protection of many important synthetic organic chemicals, notably among medicinals, of other than coal-tar origin. No effort, however, was made to secure from Congress modification of the act, as it was felt that the industry should accept in good faith the work of our representatives in Congress, and should await developments under the operation of the act.

"With the removal of the selective embargo, manufacturers immediately began to put their ships in fighting trim for the expected battle with foreign competition. The result has been steady efficiency in manufacture, rather than an extension of the lines of products."

Much more than is possible to give here was included in Dr. Herty's report, but the above survey was deemed of particular interest. He also outlined the manner in which the association may profitably busy itself during the coming year, touched upon the problems left unsolved, spoke of the growing realization by the public of what the industry has accomplished, and outlined plans for the fostering of sound public opinion.

"Don't Realize Our Progress"—Garvan

After speaking of the opposition of this country to the confiscation of German chemical works at the close of the war, Mr. Garvan spoke of the progress of the American industry, the necessity for mutual help, and the use of German dye profits for propaganda and even more sinister purposes. He said, in part:

"The progress that you have made I don't believe that you realize yourselves. I get it because I talk with consumers, with the public, with medical men, and I get a composite picture of the whole which probably you as individuals do not get. There is not a day but what consumers quietly confess to me that the dyes that they are getting are better than they ever got from Germany; that if it were not for the development of the other fellow, demanding some specialty from Germany, he would not have any use to-day for a pound of imports, and from all the information that I can gather, if you gentlemen, with a unity of purpose put your heads together and see to it that about twenty more dyes are made, the necessity for any imports, or the wish to import, no matter what European conditions may turn out to be, will have departed.

"And right there, I want to show to you the absolute necessity of co-operation in the way of aiding and assisting each other, and how it is a fallacy for you gentlemen to sit down and say, 'Well, Sulphur Black is protected by a 65 per cent or a 60 per cent duty. They cannot compete with me, and therefore the whole subject has no interest to me.'

Charges Germany Takes Back No Profits

"There are left a certain percentage of colors which Germany under ordinary circumstances can sell here. She never takes back a dollar of her profits out of that sale of her product. Her profits out of the sale of those products are kept here as a fighting fund, not against the fellow who may expect to make Golden Orange or some such color but as a fighting fund against you all as a growing industry. The fight against you in Washington, the fight against you throughout the country, has been financed entirely by the profits on the colors your progress has not made possible for the American consumer to get.

"So you all are just as much interested in each one's progress as your own. Take, for instance, $750,000 worth of Golden Orange sold in America last year: $500,000 of it was cold profit to the I. G. and $500,000 of it was

all left here as an available fund to keep up the general fight against you.

"So it is essential that you should assist each other. I know one little manufacturer that has been through his troubles. He makes two colors, and $250,000 worth of those two colors was imported last year, and yet he was treated by some of you with not entire consideration in giving a little credit here or a little help there, or a push somewhere else. And perhaps you thought you were doing him a favor. You had some feeling against him or for somebody else, or something of the kind; but you were cutting off your own head; you were contributing to the general fund to hurt yourselves.

"It should be an organization idea to sit down and take those twenty colors; if any of you have any chemical knowledge and can help one fellow who has the equipment or capacity to manufacture, offer it to him fully and freely, and in the feeling that you are helping yourselves generally.

Must Attack Foreign Markets

"The next point I want to make is that you have no assurance of safety in the future of your business until you attack foreign markets. As long as the Germans have colors not made here to provide a fighting fund, or as long as they have the unrestricted Chinese markets, composing some 60 per cent. I believe, of the world's consumption, they can create there a fund which can be drawn into this country to sell and undersell you or to destroy you according to any plan they may see fit to make.

"Remember, that is exactly what the spy fund in this country was provided for, through the old Bayer company. A million eight hundred thousand dollars in a month's time was drawn in from the agencies of the I. G. throughout the world and spent here for espionage between the years of 1914 and 1918.

"I believe that the time has come that your opponents are in such a situation, that you have reached the point of commercial production, where you can safely walk into the outside markets of the world and prevent them from making the monopolistic profits which they have in the past, which sooner or later they are certain to turn toward your destruction.

"Remember, you are the particular pet aversion of the German I. G. to-day just in proportion to the progress you have made, and only by standing together, assisting and aiding and helping each other, and by unity of purpose, can you hope to engage in the great struggle that is to come, because no matter whether it may be even more dangerous in the future if the chemical companies of the Rhine are put under joint control of the Allies, may make a reckless expenditure, a reckless selling of goods, you cannot tell what the future portends, but at least it looks like a long time.

"Just figure it out. The Cartel manufactures 240,000,000 pounds. The world needs 350,000,000 pounds of dyes. That is what it used in 1913. According to the figures of last year, every month that the Cartel is not allowed to work there is a shortage of twenty million pounds throughout the world. Twenty million pounds is thrown open for you to obtain a partial share of that market.

"You go back into the world's trade in a much cleaner and better condition than you were when you were put out of it two or three years ago. There is only hope in that situation, as I see it.

"Then, behind you all the time, without your knowledge, there is growing up the tremendous support of public opinion. That is manifesting itself in the endowment of chemistry developments in universities, of greater appreciation of American products by the consumers and by the general public who use the fabrics. The universities are absolutely inflamed upon the subject. Research institutions are being endowed throughout the length and breadth of the land, and all these are to furnish men and ideas and developments for you in the future. New products will be discovered.

"I could name at least twenty enormous products which are to-day in process of development in research institutions which will eventually furnish great commercial possibilities to you gentlemen, if you have developed your own scientific side and are equipped to take advantage of those discoveries.

"Foundation Is Going On!"

"It is not for me to discuss the fight of the Foundation. The Foundation is going on! We haven't lost any confidence in the courts of the United States, and I am quite confident that the decision will give us the great privilege of continuing the work we are trying to do. We are continuing our education, and you must continue that education. You must continue the education within the plant and without the plant, for it is impossible for you to conceive where and how often and how many times you will receive a return from it."

HEMP BLEACHING

Boil for half an hour with a 2 per cent solution of water-glass. Boil with pure water, wash, steep for twenty-four hours in chemick (1 deg. Tw.). After draining acidify with hydrochloric acid (1.4 deg. Tw.). Wash well with water. Repeat these operations as often as necessary. Another process by Kapff and Stirm is as follows: After a weak scour, boil with carbonate of soda, wash, sour, chemick (preferably electrolytic hypochlorite). Wash, sour, wash thoroughly. Repeat these operations several times, using successively weaker lyes. Finally treat with weak carbonate of soda, soap and blue. The loss in weight after these operations is 10 to 12 per cent, and the loss in strength 10 to 20 per cent, depending upon the care taken in the various operations.—Anon. Deut. Farber.-Zeitung. (Revue Textile, 1922, **20**, 1365), through Jnl. Textile Institute.

Recent Patents

Mercerizing of Cotton

U. S. 1,441,740; January 9, 1923. Amos Nelson, Gledstone, West Marton, England.

This describes a method of producing mercerized yarn which consists in first arranging a number of rovings of slightly twisted yarn side by side to form a chain without twisting the rovings together spirally on the axis of the chain, and then subjecting the chain of rovings to the mercerizing operation while under tension.

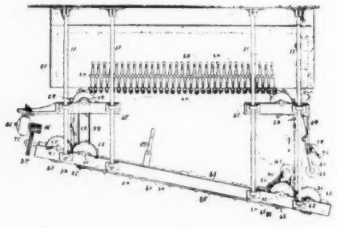
Process for Dyeing Animal or Mixed Fibers

U. S. 1,441,240; January 9, 1923. Paul Onnertz, Berlin-Wilmersdorf, and Alfred Peters, Berlin, Germany, assignors to Actien Gesellschaft fur Anilin Fabrikation, Berlin, Germany.

States in detail a process for dyeing animal or mixed fibers in an acid bath with dyestuffs easily settling out in the presence of an acid, characterized by the addition to the dye bath of sulphite cellulose waste liquor.

Dyeing Machine

U. S. 1,441,898; January 9, 1923. Paul A. Wagner, Jersey City, N. J.



Claim is granted, in an apparatus of the character set forth, a pair of flexible belts, and a series of skein carriers mounted to travel therewith, said belts adapted to collapse between adjacent carriers.

Product Made from Furfural, and Process of Making Same

U. S. 1,441,598; January 9, 1923. Max Phillips, Evansville, Wis., and Gerald H. Mains, Detroit, Mich.

Included among the claims granted are the following:

1. An amorphous composition of matter comprising the product of reaction between furfural and metanitroaniline having qualities characteristic of a soluble resin.

2. An amorphous composition of matter comprising the product of reaction between furfural and alphanaphthylamine having qualities characteristic of a soluble resin.

3. An amorphous composition of matter comprising the product of reaction between furfural and paratoluidine having qualities characteristic of a soluble resin.

4. An amorphous composition of matter comprising the product of reaction between furfural and betanophthylamine having qualities characteristic of a soluble resin.

5. An amorphous composition of matter comprising the product of reaction between furfural and metatoluylenediamine having qualities characteristic of a soluble resin.

6. An amorphous composition of matter comprising the product of reaction between furfural and methyl ethyl ketone and sodium hydroxid having qualities characteristic of a soluble resin.

Process for Dyeing or Coloring Wood and Like Fibrous Material Under Pressure

U. S. 1,447,527; March 6, 1923. Johannes Theodorus Bouwman, The Hague, Netherlands, assignor to Naamlooze Vennootschap "Ago" Maatschappij voor het Drogen, Verwerken en Veredelen Van Hout, The Hague, Netherlands.

This describes a process for dyeing or coloring wood and like fibrous material throughout its whole mass, consisting in immersing the wood, after it has been dried, in a dye under pressure, the said dye consisting of an acid and a basic dye dissolved in such a relation that the acid dye is present in excess.

Coloring Matters Derived from Pyrazolone

U. S. 1,447,485; March 6, 1923. Emil Reber, Basel, Switzerland, assignor to Society of Chemical Industry in Basle, Basel, Switzerland.

Claim is granted, as new products, for the described coloring matters resulting from the combination of aromatic diazo compounds with 1-(2'-methyl-3'-sudpho-5'-isopropyl)-phenyl-3-methyl-5-pyrazolone and corresponding to the general formula $R' - N = N - R$, wherein R' represents the complex of the 1-(2'-methyl-3'-sulpho-5'-isopropyl)-phenyl-3-methyl-5-pryazolone and R an aromatic nucleus which may carry substituents, the said coloring matters being yellow, more or less orange powders, soluble in water and in sulphuric acid to yellow solutions and dyeing wool golden yellow tints of great uniformity and excellent fastness to light.

Composition for Treating Fabric

U. S. 1,441,952; January 9, 1923. Herman J. Suib, New York, N. Y.

This is a composition for treating fabric to render the same translucent, consisting of a mixture of gelatine, water, yeast and alum, the gelatine and water being first mixed together to the proper consistency, after which the yeast and alum are added.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
Directing Editor

LAURANCE T. CLARK
Managing Editor

Published biweekly by
HOWES PUBLISHING CO., INC.
4109 Woolworth Building, New York City

A. P. HOWES, *President* E. S. PREDMORE, *Secretary*

Subscription price $5.00 per year; Canadian $5.50; foreign $6.00

Vol. XII March 12, 1923 No. 6

THE DYE MANUFACTURER'S CHANCE

FOR the first time since what may be called the establishment of the American dye industry on a firm footing in this country became a fact, American dye manufacturers have a chance to show consumers that their confidence has not been misplaced.

The Ruhr situation renders the importation of German colors, on any basis whatever, exceedingly problematical. The demand for colors in this country is on the increase; mills are busy; the market appears to be changing surely from a buyer's to a seller's. In short, indications are generally interpreted in the trade to mean that business is coming back.

A conservative advance in the prices of coal-tar products would be normal and more or less expected. But—let it be conservative.

The moment is auspicious for the dye manufacturer to show the consumer he is going to play the game. Don't jack prices up beyond reason, as many other industries might well feel justified in doing under like circumstances. Don't try to get all the traffic will bear. Don't, in plain English, profiteer.

The somewhat unique position and history of the dye industry would render such tactics unwarrantable, possibly fatal. But for the sake of consumer as well as manufacturer, and of the public as well as both, such a thing must never take place. It would do more to alienate sympathy, breed distrust and hostility, and give enemies a chance to renew their attacks upon the industry, than any amount of foreign propaganda. It would be deliberately playing into the hands of the Cartel, which, though in eclipse, is not dead.

Now is the golden chance for the dye maker to prove his claim that he is a real ally, a business partner, of the American consumer.

J. EMIL FRANK

ANNOUNCEMENT has been made of the death on March 1 of J. Emil Frank, for many years publisher and proprietor of The Textile Colorist, and well known in the dye manufacturing and consuming industries. Mr. Frank had been in indifferent health for the past year following the death of his mother, and his final illness, which lasted about two weeks, began with a cold which developed into pneumonia. Interment took place March 5 in Arlington Cemetery, Delaware County, Pa. His widow, two sons, and two sisters survive him.

J. Emil Frank was born in Philadelphia on May 7, 1874, and was the son of Morris Frank, founder of the Textile Colorist, and Mary Frank. He received his education in the public schools of Philadelphia and at the University of Pennsylvania, from which he graduated in 1895. Although associated with the publication from boyhood, he did not assume active management until his graduation, his mother having taken charge during the period between his father's death in 1888 and that time.

Mr. Frank was a member of Fernwood Lodge No. 543, Free and Accepted Masons; Lulu Temple of the Shrine; Philadelphia Commandery; the Manufacturers Club, the Philadelphia Turf Club, and of Harmony Assembly of Artisans' Order of Mutual Protection, all of Philadelphia; of the Chemists Club, the Railroad Club of New York, and the Pleiades Club, all of New York, and of the National Association of Cotton Manufacturers.

His sudden death will be mourned by a wide circle of friends and associates, and The REPORTER takes this opportunity to express its sincere sympathy for the bereaved widow.

MR. MUSSOLINI AND ITALY'S DYE INDUSTRY

RAFFAELE SANSONE, writing from Genoa, in this issue states that the Mussoloni Government has appointed a commission to study the Italian dye and other industries with a view to encouraging, by means of income tax exemptions and other inducements, the investment of foreign capital in domestic enterprises. The plan is to bring about the growth of the dye industry in Italy under free trade conditions, and to this end one of the first acts of the Fascist administration was the removal of the existing dye embargo and duties.

This complete reversal of Italy's former policy shows that there has indeed been a real, if bloodless, revolution in that country. Time was when Italy was listed among the solid ranks of dye-protecting, Hun-strafing Allied powers whose example the United States was most conspicuously refusing to follow.

Now the basic purpose is no longer the destruction of Germany's dye industry, but the protection by each country of its own. America may fairly be said to have taken her place among those determined to be independent of foreign factories, as is shown by her recent tariff, and,

more significant, the specific statement of Congress that the law is intended to protect the American dye maker; whereas, on the other hand, Italy rather appears to have backslid. Indeed, if her move is not an actual surrender to old conditions, it at least looks very much like an overture.

But such, however, may not be the case at all. Whether the present policy, if persisted in, spells suicide for the Italian dye industry, is to-day debatable. At one time it would certainly have appeared so. But if the decision to do away with embargo protection seems unwise, the plan to secure the co-operation of foreign capital in building dye works in Italy offers possibilities which argue at least that someone has been doing some thinking.

Italy is not America in many ways. It must be remembered that at the outbreak of the war Italy was nominally an ally of Mitteleuropa, that Germany practically controlled the banking situation in Italy, and through it many Italian enterprises, including such dye factories as were then operating. Italy remained neutral until induced to throw her resources on the side of the Allies, and at the termination of the war it is not to be supposed that the many understandings and associations built up over a period of years were dead beyond recall. From the very beginning of the reconstruction period, Germany has made strong efforts to re-establish her former status in the dye markets of the world, and Italy has been one of her chief concerns. Many things were favorable to a partial resumption of relations, not the least of which was the fact that the Italian slant on things German, if such a term may be used, was hardly that of England, for instance, or France.

Italy, going it alone, has not done conspicuously well with her dye industry and, while it is true that many local conditions, rather than a lack of brains and organizing ability, have militated against this, much discouragement was felt.

Hence it appears that while those who have been directing Italy's destinies have certainly not overlooked the defence side of the coal-tar chemical industries, they have come to the conclusion that their purpose can be attained by some means other than high tariffs or embargos. If Italian factories, manned by Italian labor and directed by Italian chemical brains, can be built up to a point of high operating efficiency and sufficient capacity on foreign capital, then, in the event of trouble occurring in the future, Italy will have those factories and will know how to run them to supply her needs, and in the event of war they can be taken over and operated by the Italian Government.

All of which, taking the numerous factors affecting this particular case into consideration, looks like an excellent bet for Italy.

Italy is perfectly well able to produce a dye industry from within herself, but is shy on capital, as are all the European nations. She appears to have chosen a good scheme for obtaining what she requires, and if successful will probably save herself several years at least of the time which would otherwise be required to build up her industry.

It is almost needless to remark in passing, however, that whereas this may be a good scheme for Italy, it would never have done in America—which, to mention only one point of difference, has not been troubled by lack of capital. The expedient employed by Italy is one of desperation, while the method chosen by America, the method of rigid protection and the admission only of colors not made here until the American industry was in such shape as to be able to supply them, was the one logical course open to us under conditions prevailing in this country and in Germany.

What the future holds in store for Italy as an independent dye-producer cannot be predicted with any degree of certainty by anyone just now, for the reason that the new rulers are about to conduct an experiment in this field. If they remain in power long enough to carry it to its intended conclusion, the results should be most interesting.

AN APOLOGY

IN reviewing the Second International Silk Exposition in the last issue, The REPORTER believed ieself correct in stating that the booth of the National Aniline & Chemical Company was unattended throughout the course of the show. Such, however, was far from being the case, for Dr. Louis J. Matos, who arranges and personally supervises all of National's exhibits, together with a number of other people from the company, were present to answer questions and meet representatives of the trade. We know the Doctor's ability in this direction of old—have often, indeed, marveled at the truly great amount of personal zeal which he puts into the grueling task of explaining the same thing hundreds of times over both to casual and technical visitors alike—and in the circumstances we deeply regret that an injustice was done him in these columns. The Doctor has done a vast deal of that most important work of "selling" the American dyestuff industry to the American public.

Likewise, we have many times taken occasion to point out that in the matter of education, the National Aniline & Chemical Company has consistently led the way, and have ever been ready to assert that more American manufacturers should follow its example in this respect. It was primarily to call attention to the fact that out of the entire American industry, National was the only company to realize the opportunity of the Silk Show, and to deplore this lack of perception on the part of the trade in general, that the notice in question was written in our last issue.

To National, then, and to Dr. Matos, we feel that we owe a sincere apology for our blunder, and to them we offer it, coupled with the assurance that their educational work is appreciated by none more than this publication.

INQUIRY DEPARTMENT

All classes of chemical work or advice relating to artificial colors, natural dyestuffs, dyewoods, raw materials, extracts, intermediates, crudes, or dyeing chemicals and accessories in general, will be carried out for readers and subscribers of the AMERICAN DYESTUFF REPORTER by this department.

Inquiries of a minor character will be answered on this page, while major matters involving personal investigation, analyses, perfected processes and working formulas, will, if desired, be treated confidentially through the mails. In answering inquiries which, by their nature, require reference to the products, processes or apparatus of some particular manufacturer we aim to be absolutely impartial. We refer the inquiries to specialists whom we believe to be best qualified to answer them intelligently, and must disclaim responsibility if their reports show unintentional bias. All questions, materials for analysis or letters leading to the opening of negotiations for special work will receive prompt attention if addressed to Inquiry Department, American Dyestuff Reporter, Woolworth Building, New York City.

L. R. X. Co.—*Question:* We are anxious to use some artificial silk for knitting purposes, both circular knitting and warp knitting. Our present trials have been unsatisfactory, as we find the artificial silk to be very brittle and of a harsh nature. It is our opinion that if this silk could be softened in some way our results would be much better, and we would like to know if you can recommend any solution which will have this effect. Any additional information you may have that will prove helpful when using artificial silk in knitting machines will be appreciated.

Answer: We would suggest that you take up this problem directly with the manufacturers of artificial silk, as we are sure that it is possible to supply a fiber of sufficient softness and elasticity so that it can be used successfully in knitting machines. So far as we know, there is no product on the market which will satisfactorily soften some of the harder grades of artificial silk.

A. D.—*Question:* I recently read Dr. Scott's article in your magazine on chemical control of dyestuffs, and would like to know more about the Kjeldahl method for estimating the strength of dyestuffs. Any further information you may be able to give will be appreciated.

Answer: There is very little which can be added to Dr. Scott's remarks on this subject. The Kjeldahl method for the determination of nitrogen in organic compounds is very well known, and a description of the same can be found in almost any book on analytical chemistry, such as Treadwell and Hall's "Quantitative Analysis." The theoretical percentage of nitrogen of any dyestuff whose constitution is known can be figured from the formula as given in the Schultz dyestuff tables. The comparison of the actual percentage of nitrogen obtained with the theoretical percentage for pure dyestuff will give the actual strength of the sample tested.

D. G. R. Co.—*Question:* We are manufacturers of grass and wool and fiber rugs, and are looking for information relating to waterproofing of paper. We would be pleased to have you send us addresses of any companies manufacturing a waterproofing to be applied to the paper rug after it has been made up or to the pulp while it is in the beater. Any information you can give us will be greatly appreciated.

Answer: We have made several inquiries in regard to waterproofing paper fibers and beg to give you herewith the results of same. None of the information is very definite, but perhaps it will be helpful. A summary of our investigation is as follows:

(a) The quickest and simplest way to waterproof paper stock is the employment of rosin size and alum; 3 per cent size and 3 to 4 per cent alum added to the beater should produce a good waterproofing; 2 to 3 per cent of starch could also be used in combination with this method, although the improvement would not be very great and there would be a tendency to produce a rather stiff fiber.

(b) To the finished paper a tub sizing with glue or hide cuttings can be applied, either to the entire sheet or to the strips of paper just before they are twisted into yarn. In this case the paper would have to be given a chance to dry in hot air. The resulting waterproofing should be excellent, but the paper would also be stiffer than usual.

(c) Another possibility is to tub-size the strips of paper, twist them into yarn, weave the rug, and then dry the completed rug in hot air. A light coat of varnish or shellac after the rug is finished would also have a tendency to waterproof in a very satisfactory manner.

(d) The twisted strands of paper are dipped or run through a solution of commercial glue at a temperature of 140 deg. Fahr. The glue solution should be of such strength that it shows a reading of 10 to 12 on a Baume scale glue hydrometer made by Hudeston, Boston, Mass. After the glue is dry, the fiber is given a coat of varnish.

It would hardly be possible to add anything to the beaters to render the sheet absolutely waterproof, but heavy sizing might be of benefit and make after-treatment more effective. "Butcher's Fiber," which is usually bloodproof for several hours, is given 4 to 5 per cent rosin size and 5 to 6 per cent of alum in the beaters.

Another informant, after mentioning the rosin and alum size, says that he has heard that formaldehyde is used for this purpose and is added to the pulp while in the beater. He has also heard that silicate of soda can be used for this purpose.

We also understand that the Flintkote Company, of Boston, Mass., has developed a waterproofing process for paper board which it calls the K. P. process. The basis of this waterproofing is asphalt, and it is possible that it might be adaptable to your purposes.

Dyeing Wool in Fast Colors

Search for Bright Mordant Colors—Methods of Mordanting—Developments of Indigo Dyestuffs—Effect of Chroming on Strength of Wool Fiber—Fast Acid Colors

By B. WUTH

BASLE has been connected with the dye trade for over 150 years, the oldest of the now existing firms having been founded as far back as 1764. This historic dye town in Switzerland was visited by members of the West Riding Section, Society of Dyers and Colourists of Great Britain, and at a meeting held there an excellent paper was read by Dr. B. Wuth on "Dyeing Wool in Fast Colors." Dr. Wuth first dealt with the history of the development of the chrome colors, such development having been the result of over 100 years of research work on the part of numerous chemists. As a result of this research work we now have the almost complete ranges of Eriochrome, Chrome Fast Dyes, and Omega Chrome Colors of Swiss manufacture. Continuing from this point, Dr. Wuth stated:

The fastness properties of these (chrome) colors are not all alike; they vary, as do the natural colors and also the alizarin, but as each material does not demand the same treatment, there is room and a use for all, and aided by the carefully and conscientiously compiled fastness tables, it is not difficult for the dyer to choose a product suitable for his special class of work.

To this class of color belongs also the Erio Brilliant Blue and the Erio Alizarin Blue which dye on chrome or copper mordant full shades of blue fast to milling, and have found large use. Further, of interest are the Alizarin Blue OCR and OCB brands of the Sandoz Company, which are employed by the Chromosol method of the same firm.

Discoveries Following Search for Bright Mordant Colors

The older mordant colors usually lack brilliancy of shade, and it would seem as if the brightness of a color is decreased as the fastness is increased. To enhance the bloom of a given mordant color shade it was necessary to fall back on the fugitive acid colors for shading purposes, a procedure which naturally lowered the standard of the dyeing. For this reason the more recent discoveries of bright oxy-derivatives of the diphenyl and dinaphthylmethane groups were both interesting and welcome. I refer to Eriochrome Azurol and Eriochrome Cyanine of Geigy, and the Naphthochrome colors of the Society of Chemical Industry, including the latest product, the Naphthochrome Green G. These modern colors surpass all known mordant colors in regard to their brilliancy of shade combined with excellent fastness to milling and potting. They can be used for shading purposes by adding to the bath after a slight coloring.

Methods of Mordanting

The natural colors and the alizarins are closely related in tinctorial character, and are fixed on the mordanted fiber either from a suspension in water or from an aqueous solution. As mordant, chromium occupies the chief position, but whereas the dichromates, on account of their oxidizing properties, possessed certain advantages for the dyeing of natural colors, they proved less suitable for the alizarins, and yielded badly rubbing shades. It would lead too far to enter upon the various theories which have been put forward to explain the mordanting process; the only fact that is known with absolute certainty is that the metal is absorbed by the wool in the form of hydrate. If bichrome is used with or without addition of sulphuric acid, a combination, chemical or mechanical, is arrived at and the chromic acid must necessarily be reduced to chromium oxide prior to the formation of the chromium-dyestuff lake. With some natural colors, and foremost with Logwood, the dyestuffs itself is oxidized at the cost of the chromic acid by its action as a reducing agent for the latter, but with other dyewoods accmpanying vegetable impurities do the work. In using alizarin colors a large portion of the dyestuff was destroyed by oxidation in acting as a reducing agent to render the combination of the remaining portion with the mordant possible; thus an excessive amount of dyestuff had to be used. To eliminate this disadvantage the chromic acid was reduced during the mordanting process by the addition of a suitable reducing agent, generally tartaric or oxalic acid or later formic acid.

It was found that the application of chromic oxide salts, which show but little tendency to dissociation into basic salts and free acid, penetrate the fiber more evenly than free chromic acid, so that by this method of mordanting, shades which rub less and are much more level are obtained than by dyeing on a dichromate mordant; the wool retains, moreover, a softer handle, and absorbs water more rapidly. At first fluoride of chrome was recommended, and in some measure was adopted by the dyeing trade after the difficulties caused by the hydrofluoric acid had been

overcome; it was used in place of bichrome wherever the oxidizing action of the chrome acid on the dyestuff was to be feared. The use of fluoride of chrome has the disadvantage that it must not be brought into contact with metallic copper, as it is thus decomposed to chromium hydroxide, and besides this hydroxide a considerable amount of copper oxide is precipitated onto the fiber and influence the resulting shade. As copper pans were in frequent use in dyehouses this circumstance considerably impeded a wider introduction of the fluoride of chrome method, and all propositions to overcome the difficulty proved unsuccessful. Mordanting with fluoride of chrome is nowadays no more heard of; bichrome is almost exclusively used with an addition of either tartaric, oxalic, lactic, or formic acid.

The One-Bath Method

In order to lower the cost of production by a saving of time, labor, steam, etc., the old one-bath method was again reverted to of dyeing the wool in a mixture of dyestuff and mordant, such as was formerly in use for Cochineal and tin chloride, Fustic and alum or tin chloride, Logwood and iron sulphate or copper sulphate, Madder and bichrome, etc. This method can naturally only be applied to such dyestuffs and mordants as form precipitates soluble in an acid liquor. Some few products, such as Alizarin Blue, exhausted relatively well, but the majority of the available colors only yielded light shades, as a large part of the dyestuff remained inactive in the bath as an insoluble lake. For the application of Diamond Black F it was recommended to boil the wool with the dyestuff solution for a short while, then to add the solution of bichrome gradually, and to boil for one hour. The results were unsatisfactory owing to the premature formation of the color lake in the bath. It was a better idea to effect the formation of the color lake in or on the fiber by regulating the reaction between dyestuff and mordant by varying the temperature or by the use of auxiliary agents. This procedure is based upon the fact that one of the lake components, the dyestuff or the mordant, is absorbed by the fiber before the combination of the dyestuff with the mordant can take place in the bath. The lake is formed at about 180 deg. to 200 deg. Fahr., whereas the absorption of the dyestuff by the fiber commences at 120 deg. Fahr., and is almost complete at 140 deg. to 160 deg. Rahr. In fact, this one-bath method resembles the afterchroming process.

It must not be forgotten that the chromic acid had a destructive influence on many colors; further, that certain chromium salts form color lakes at 100 deg. Fahr., and finally that the acid of the mordant which accumulates in the bath as the chromium oxide is absorbed by the fiber is capable of stripping the already formed color lake from the fiber.

Improvement of One-Bath Method, the Metachrome Process

A valuable technical improvement of this method was effected by the use of ammonium salts as auxiliary agents. This is the so-called Metachrome process. A mordanting liquor containing chromate and ammonium sulphate is neutral. By boiling, it gradually becomes acid, as part of the ammonia is liberated and evaporated or oxidized to water and nitrogen by the chromic acid. If dyestuffs are added to the mordanting liquor at the start, primarily no reaction takes place between dyestuff and mordant; the dyestuff is absorbed by the fiber, and only at the boil the chromic acid is very gradually liberated, absorbed by the wool, which has great affinity for it, and reacts with the color already fixed upon the wool. The process continues in this manner until, assisted by the ever-increasing acidity of the dye bath, both dyestuff and chromic acid disappear from the liquor and appear in their combinations as a lake on wool.

After-Chroming Processes and Dyeing

It proved to be an individual property of single dyestuffs to give practical results when applied in this manner, and it was further shown that the same effect can be obtained with certain azo dyestuffs by using them together with bichrome, starting the operation neutral and gradually adding acid to the bath. Another one-bath process consisted of preparing the bath with color and bichrome, and adding acetic acid as a solvent for the lake; as soon as the dyestuff was driven onto the wool by boiling, the bichrome was set in action by the addition of sulphuric acid. In reality all these methods are after-chroming processes, as the chromic acid only becomes active by the addition of acid, and reacts on the dyestuff after it is on the wool fiber.

The unsatisfactory results obtained by boiling the wool in the dyestuff solution and then adding the mordant led to the proposition of dyeing the wool and then treating the dyed fiber in a separate mordant liquor, whereby the reaction between dyestuff and metal can only take place on the fiber. This method was first recommended in 1890 for Diamond Black, later for Anthracene Red, and 1892 for the sulphonic acids of alizarin dyestuffs, and we can safely say that with the mordant colors of the azo type it is the most widespread method of dyeing at the present day.

Experiments with Alizarin colors showed that on an average the dyeing on mordanted wool yields more level shades than are obtained by the after-chroming process, whereas the Chromotropes and the majority of the azo-mordant colors are less level on mordanted wool than when the metal compound is added to the exhausted bath after dyeing.

For the old mordanting process various metal com-

pounds were in use, and the same salts have been recommended with more or less success for the after-treatment. None but chromium compounds have found any wide adoption, and of these the salts of chromic hydroxide, such as chromium fluoride, etc., do not yield as fast colors as the bichromates; in many cases no development takes place at all owing to the lack of oxidizing power.

We have seen how new processes have been developed in order to eliminate the disadvantages of the older methods, and the fact that no one method has been generally adopted, or has succeeded in completely abolishing the others, proves that all processes have their advantages as well as their disadvantages. It is not uninteresting to weigh these up against each other.

The Three Methods of Dyeing Wool Fast Summarized and Compared

Three methods are in use and in competition, namely, (1) Dyeing on mordanted wool, (2) simultaneously dyeing and mordanting, (3) dyeing and afterchroming.

In surveying the advantages of the first and oldest method, the dyeing on mordanted wool, this is preferred by the practical dyer, because he can easily control the final result. If not on-shade he can add the small quantity of the necessary dyestuff for toning up his pattern. This method has the further advantage that greasy wool can frequently be well dyed. The disadvantages consist, besides the length of the process, in unsatisfactory penetration and looseness on rubbing. This has been theoretically explained by Knecht by the formation of an impermeable chrome-lanuginic acid layer caused by the chemical change which the wool fiber undergoes on treatment with chromic acid. This layer influences the osmotic properties of the fiber, and prevents penetration of high molecular dyestuffs, and causes precipitation of the pigment onto the outer surface of the wool.

The simultaneous dyeing and mordanting method has been a product of long study and innumerable experiments, and still no process has been found applicable to all mordant colors. The main processes are the so-called Metachrome, Monochrome, Eriochrome, and the Chromosol methods. The Metachrome process I have already mentioned as a mordanting method with neutral chromate and ammonium sulphate. It is claimed that the gradual development of acid by the slow decomposition of the ammonium sulphate effects a gradual and level exhaustion of the colors. Simultaneously chromic acid is liberated, and the dyestuff already on the fiber is chromated. Overchroming or premature formation of the dyestuff lake is claimed to be impossible, therefore there are no rubbing shades or muddy dye baths. The Monochrome and the Eriochrome methods involve the use of bichromate, and produce with the particular colors suitable for those methods good dyeings in a much shorter time than with the Metachrome process, and leave the wool soft and open. The Chromosol method consists in the use of a chromium oxide compound which forms the color lake in the same manner as fluoride of chrome, but at the same time has not the disadvantages of the fluoride which have been already mentioned.

The working of these methods is simple. The wool assumes from the start the desired shade, and with the addition of acetic or formic acid the dye baths for medium shades are well exhausted. The main disadvantage is that the dyer is restricted to the use of a comparatively small number of colors, and if he has not the time and opportunity to make his own tests as to the suitability of other colors than those recommended by the promoters of the special process he is bound down to the products shown and recommended in the individual pattern card. I feel sure that the one-bath process in one or the other form would be more generally adopted by the dyer if he had a small compendium at hand containing a list of all colors on the market, whatever make they may be, showing their suitability for applying by the Metachrome, the Monochrome, the Eriochrome, the Chromosol, etc., methods.

The afterchroming process claims many advantages. Whereas dyeing mordanted wool the color lake is deposited more onto the surface of the fiber, the chrome developing colors can penetrate into the fiber thoroughly during the dyeing and before the development.

(To be concluded.)

LABORATORY DIRECTOR

A large manufacturer of dyestuffs wants a capable man to direct the work of its service laboratory. The applicant must have had wide experience in dyestuff testing, sample matching, etc., and must be capable of taking charge of a large laboratory force. This is an unusual opportunity with an excellent future for the proper man. Address Box 223, care of the American Dyestuff Reporter.

EXPERIENCED SILK DYER WANTED

Wanted—Experienced silk dyer to take position as assistant in a piece dyeing establishment which produces a varied line of all-silk, silk and wool, and silk and cotton fabrics. Also an experienced silk skein dyer. In making application please state fully age, education, previous employments, nationality, and salary required to accept position. No one without silk dyeing experience need apply. Address Box 224, care of the American Dyestuff Reporter.

Established 1895

BOSSON & LANE

Manufacturers of

The Original

BLEACHING OIL

for boiling out Cotton, to produce a foundation for a Pure White

High Grade Sulphonated and Saponified

CASTOR OIL PRODUCTS

Para Soap Oil

Solvents and Assistants for cleaning all Textiles

B & L Bleachers' Bluings and Tints

Works and Office, ATLANTIC, MASS

1816 CHEMICALS *1922*

"Over a Century of Service and Progress"

BLEACHING POWDER

FINISHING MATERIALS

FORMIC ACID

COLORS

GUMS and WAXES

DYESTUFFS **CAUSTIC SODA**

INNIS, SPEIDEN & CO.

Manufacturers, Importers, Exporters of Industrial Chemicals

46 Cliff Street **New York**

BRANCHES:

Chicago Philadelphia Boston Cleveland

Gloversville, N. Y.

Latest 1914 Berlin Edition of

"FARBSTOFFTABELLEN"

By Dr. Gustav Schultz

Containing over 1000 dyestuff formulæ reprinted and exactly reproduced by photographic process on fine white paper, and substantially bound in heavy black cloth and leather.

Can now be had from us at $10 per volume.

HOWES PUBLISHING COMPANY

4109 Woolworth Building, New York

Extend Your Market—
Get New Business—
Make New Friends—
Get New Ideas—

AT THE 19th ANNUAL

Knitting Arts Exposition

Under Auspices of National Association of Hosiery and Underwear Manufacturers

Commercial Museum, Philadelphia

April 2 to 6

The annual "get-together" of the trades—The Exposition that creates new business—the time and the place where the Manufacturer, the Jobber, and the Retailer find every opportunity for personal contact.

Every manufacturer of Knitting Machinery, Knitted Underwear, or Outerwear, Yarns, Mill Equipment or Accessories, who seeks to widen his market, should display his line at this great business-making Exposition.

Applications for Exhibition Privileges should be made at once, as the remaining space is limited

Under the Personal Direction of CHESTER I. CAMPBELL

Address all communications to Executive Offices of Exposition

5 Park Square, Boston, Mass.

"It Pays to Swim with the Current"

This is about two spark plugs. At the moment they are lying on the sales manager's desk in the establishment of a large middle-western hardware jobber.

One spark plug bears a name known wherever automobiles are used, the other a name seldom heard.

Both, says the sales manager, are good plugs. On the score of quality they run neck and neck.

"But," he adds, "we are discontinuing this line"—and he holds up the plug of unfamiliar name. "Yes, and our discount on it is larger, too."

"What's wrong with it? Not a thing. It's a good plug—mighty good plug, but —no one knows about it. It isn't advertised—the other one is. The demand is for the advertised make. And we've learned it pays to swim with the current, not against it."

More and more jobbers in every line of business are learning every day that it pays to swim with the current of popular demand.

"Our job," said one jobber, "is to supply markets, not create them. Let the manufacturer make a market for his goods, and we will handle it."

Said another—"Our salesmen carry a catalog with thousands of items in it. They haven't the time to push unadvertised goods. Their work is principally taking orders."

If you go among these wholesalers to-day to introduce a new product in competition with merchandise nationally advertised, unless the article is exceptional, you will be met everywhere by the injunction: "First go out and get a reputation for your goods through advertising."

The wholesaler knows by actual contact with dealers how they value speed of turnover, goods which move with a minimum of effort, goods people know about and ask for.

[Published by the American Dyestuff Reporter in co-operation with The American Association of Advertising Agencies]

THE NEWPORT COLORS

For Satisfaction

No sale is considered complete until the customer is entirely satisfied, and to insure this, several precautions are instituted which, since they guard your interests, merit your consideration when placing dyestuff orders.

PROGRAM

Our manufacturing program is based on trade requirements; i. e., WE HAVE THE COLOR YOU NEED.

SERVICE

Our sales force is augmented by an efficient application laboratory and a corps of specialists who can visit your mill and demonstrate practically the solution of your dyeing and color problems.

UNIFORMITY AND DEPENDABILITY

We maintain an independent laboratory where the most elaborate and cautious tests are conducted to insure the maintenance of strength and shade of every batch of color. For pulverizing, standardizing and mixing, the latest and most ingenious devices are used under the constant superintendence and study of experienced engineers.

STOCKS AND TRANSPORTATION

Warehouses are stocked and so located, and truck and rail routes so arranged, as to give our customers the promptest possible deliveries.

NEWPORT CHEMICAL WORKS, Inc.

PASSAIC, NEW JERSEY

BOSTON, MASS. PROVIDENCE, R. I. PHILADELPHIA, PA.
GREENSBORO, N. C. CHICAGO, ILL.